

JOURNAL

OF THE

OIL AND COLOUR CHEMISTS' ASSOCIATION



Vol. 48 No. 8

August 1965

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SECTION PROGRAMMES 1965 66

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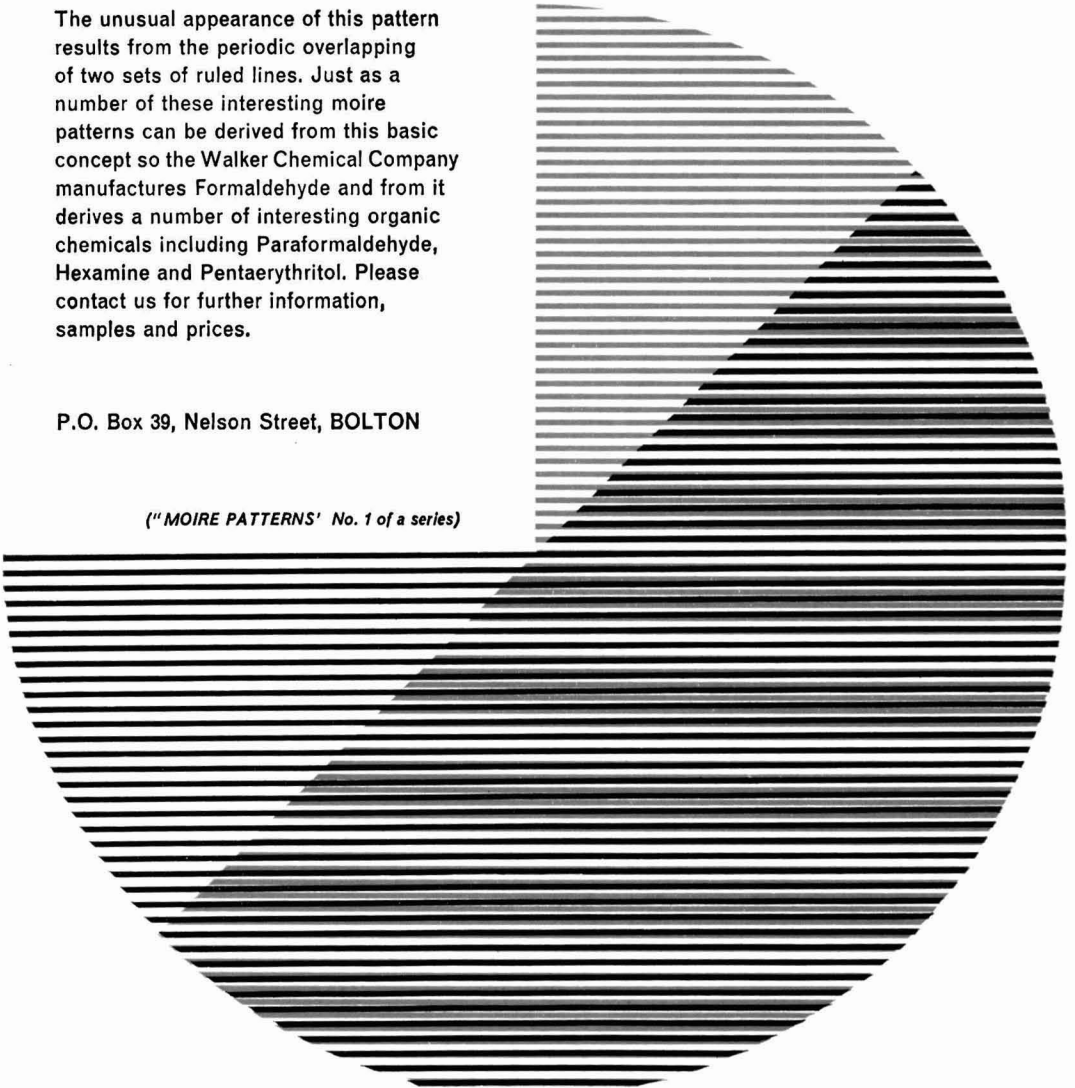
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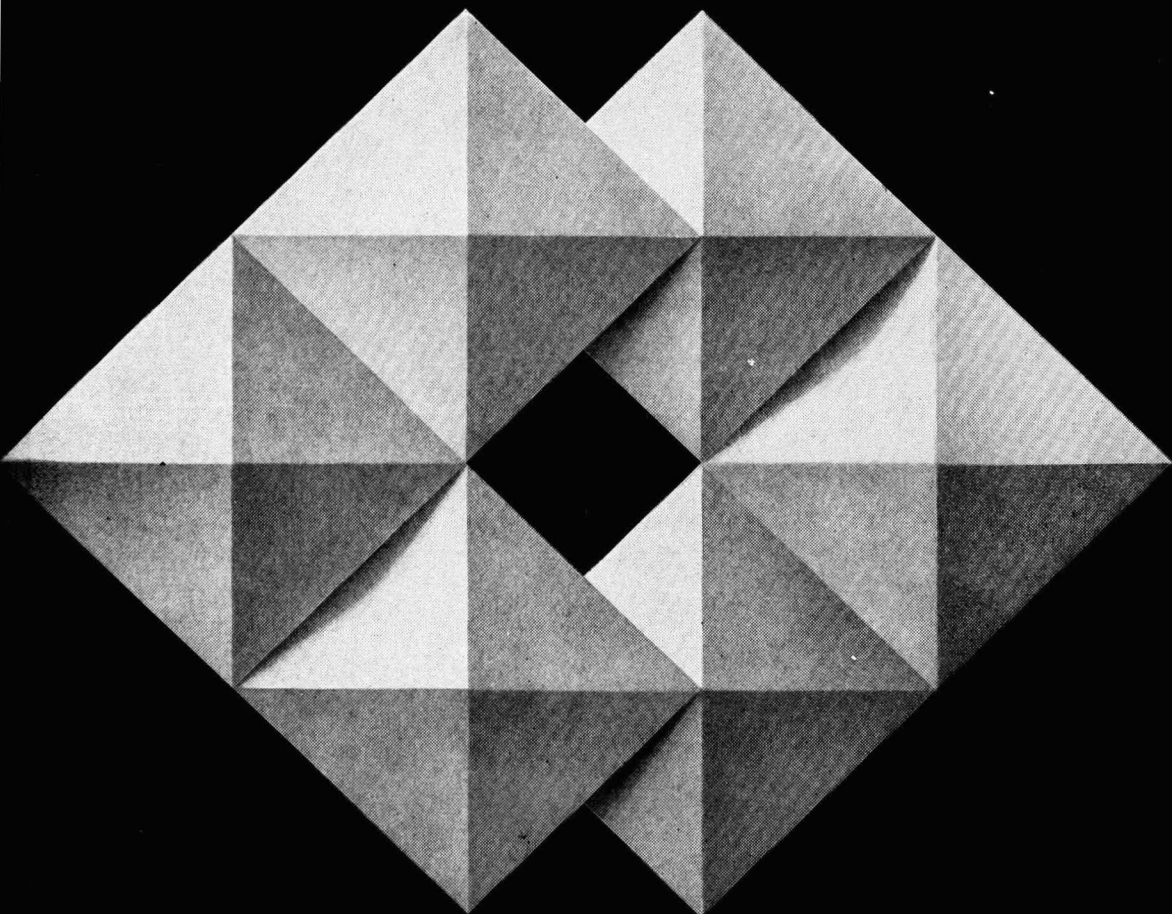
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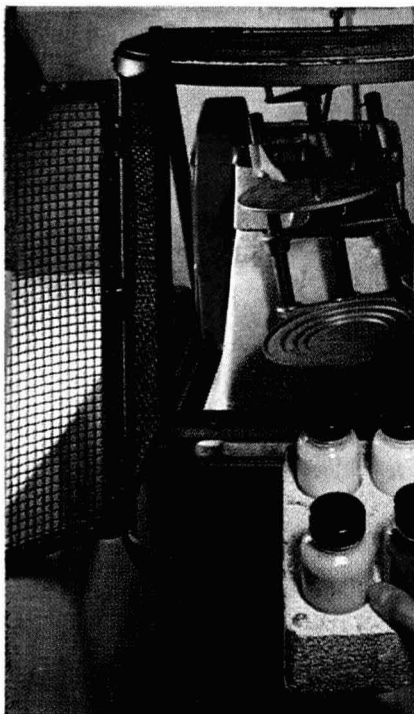
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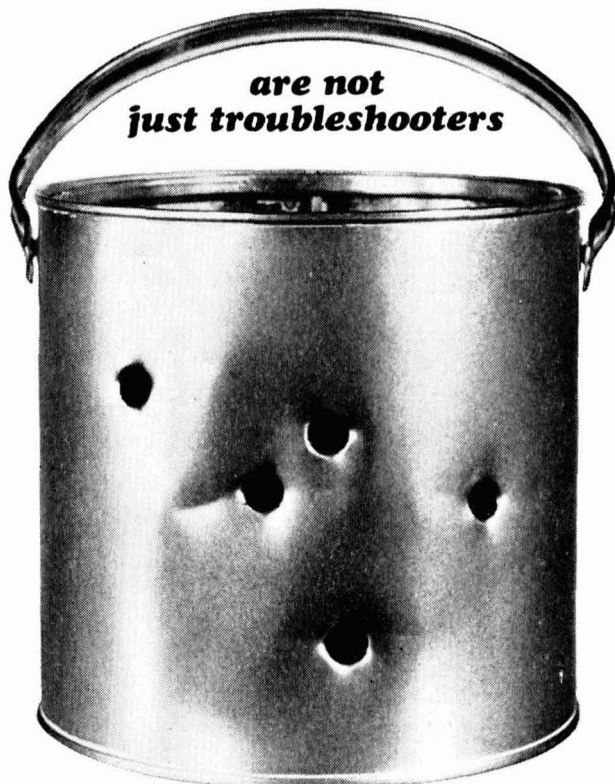
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PAINT TECHNOLOGY MANUALS

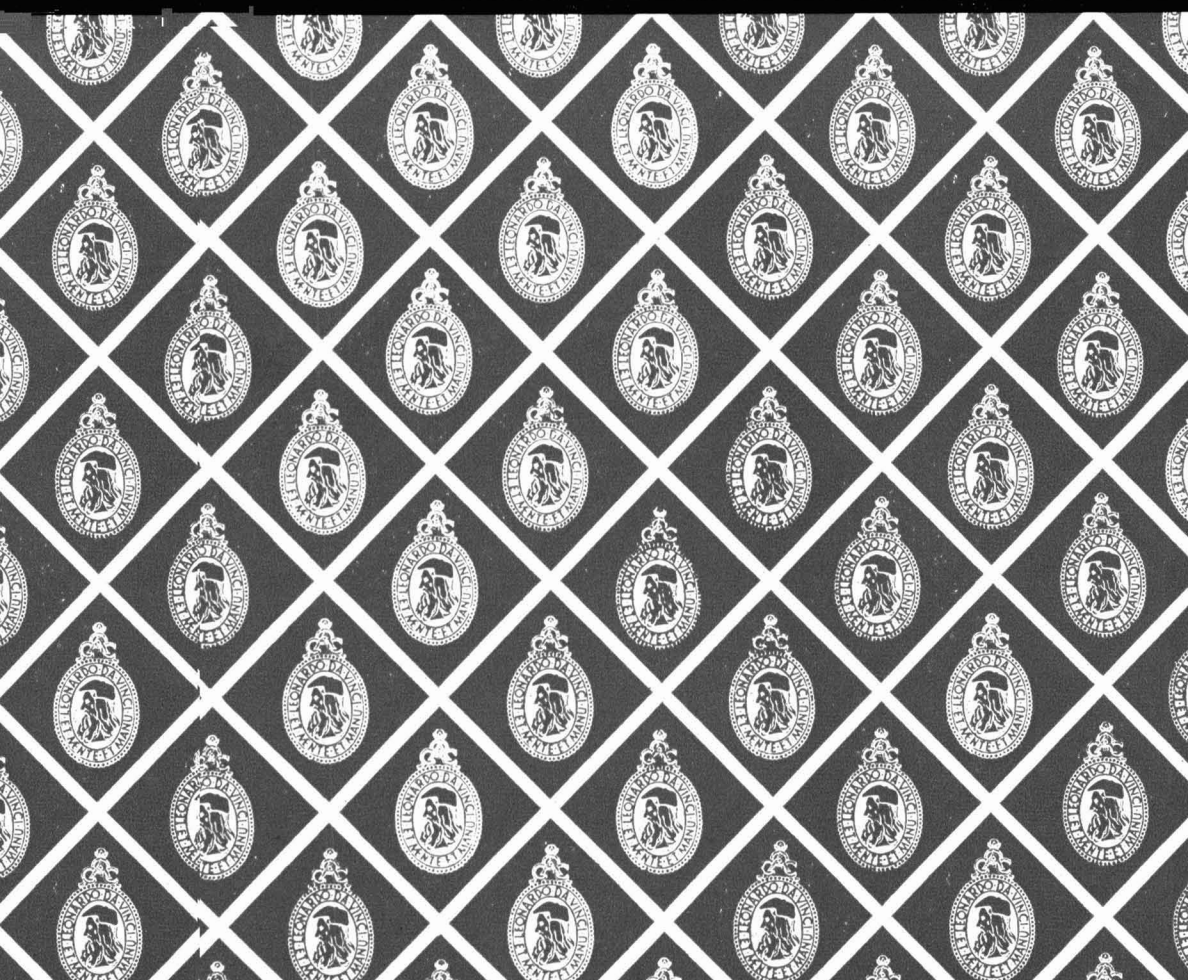
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PART FOUR

The Application of Surface Coatings

PART FIVE

The Testing of Paints



PAINT TECHNOLOGY MANUALS

The Oil and Colour Chemists' Association (President: S. H. Bell, Ph.D., D.I.C., A.R.C.S., F.R.I.C.) has enlisted the services of specialists to write an authoritative work on paint technology. It is to be published in seven parts, parts Four and Five being announced here, and will be of value to those taking the City and Guilds of London Institute Examinations in Subject 9 (Paint Technology) and to all users of paint in industry.

Part Four

The Application of Surface Coatings

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The story of OCCA

By G. Copping

Members will have read in the April issue of the *Journal* that the Council has decided to postpone the publication of the History of the Association which I had written in collaboration with Dr. S. H. Bell (President) and Dr. H. A. Hampton (Past President). I had in the History traced the founding and the growth of OCCA up to the time of incorporation in January, 1963, but the decision now is to publish the History in May, 1968, when the 50th Anniversary of the foundation will be celebrated, bringing the story up to that date. In view of this postponement, it was felt that a short article now, based on the History, would be welcomed.

Before the beginning

When I was approached by the then President (Dr. H. A. Hampton) to write the History of OCCA, Dr. S. H. Bell (now President) had already collected a great many documents and had also done much research. In our preliminary talk he suggested that the first chapter might be headed "Before the Beginning", a title which intrigued me, so, aided by his notes, I searched back to the early part of this century, to the year 1905, to read a letter written by the late Noel Heaton to the editor of the *Oil and Colourman's Journal* (now *Paint, Oil & Colour Journal*). In that letter he said he had unsuccessfully hunted for an organisation "connected with our trades" similar to those of the Dyers and Colourists and of the Leather Trades. There was room, he said, for an Association of "Colour makers and Colour users," to protect the interests of both, to provide a field for discussion of matters of interest, and an opportunity for those interested in their work to meet with congenial spirits; to bring about a better understanding by both of the Sciences on which the industry was based.

Although OCCA was not born until May 1918, this, I felt, was the first seed to be planted. It did not fall on stony ground; it started off much correspondence, writers seemingly taking two sides, one advocating a greater use of chemists and the other stressing a need to see that workmen were technically trained. One correspondent said the manufacturers were:

Woefully blind to the necessity of trained guidance

A desire for technical education in the paint industry seemed to develop from these discussions and classes operated at two centres in London, at the Regent Street Polytechnic and the Borough Polytechnic. Both started student societies, but before long there was a desire to "get away from the classroom atmosphere" (to quote from records left by the late Noel Heaton), so the two Societies met in order to unite in forming a technical society for the trade in general.

The Paint and Varnish Society

Thus was born the Paint and Varnish Society (in 1907) and it was not surprising that Noel Heaton became the Hon. Secretary.

The Paint and Varnish Society held regular meetings at St. Bride's Institute, near Ludgate Circus, London, and noted men of the day read papers. Zinc oxide and white lead were the main pigments discussed until 1921 when Noel Heaton once more blazed a trail and gave a paper on "The Production of Titanium Oxide and its use as a Paint Material." Many will know that he played a big part in the introduction of titanium dioxide as a pigment.

OCCA is born

However, we have now gone past the birthday of OCCA, for our Association was born on 16 May 1918, in St. Bride's Institute, London, where the Paint and Varnish Society held its meetings. The first President was Dr. F. Mollwo Perkin. Mr. H. A. Carwood (whose pioneer work has been commemorated in the Carwood Memorial Lecture) combined the offices of the Hon. Secretary and Hon. Treasurer. The first Council consisted of Mr. W. Baird, Mr. R. P. L. Britton, Dr. H. H. Morgan, Mr. W. J. Palmer, Mr. B. Thompson, Mr. T. M. Tyson and Mr. H. R. Wood.

OCCA was born as a direct result of World War I. For war purposes linseed oil was split into glycerine and fatty acids. The Government wanted the glycerine, so, early in 1918, a committee, consisting mainly of chemists, was formed under the title of the "Linseed Oil Substitute Committee," to see what use could be made of the fatty acids. Experimental work was undertaken by members of the committee, but it was not long before the committee was wound up.

But the chemists had now found that through the Committee there were benefits to be obtained from discussions, and Mr. H. A. Carwood, who had been Secretary of the Committee, became the spearhead of a movement which began with an exploratory meeting in April 1918, and finally saw the founding of our Association in May of that year.

The Paint and Varnish Society was still in being and continued to issue reprints of its lectures, but OCCA desired a *Journal*, though the first published was a straightforward report of a paper by W. J. Palmer. That was in June 1918. At the end of the report was this Resolution :

At the first meeting of the Oil and Colour Chemists' Association, in view of the large use made of linseed oil fatty acids, it was unanimously decided that in the interests of the trade and even under war conditions a higher percentage than 2 per cent of water should not be allowed. The amount of water should be reduced to this percentage in manufacture, but if larger percentages were delivered a penal rebate of some description should be insisted upon.

Dr. H. H. Morgan was the first Hon. Editor of the *Journal* and later President.

An Institute of Paint and Varnish Technologists Proposed

By 1924 the Paint and Varnish Society had ceased to be a separate entity. It was incorporated into our Association, but before this took place there was a strong movement to found an entirely new body, to be called an Institute of Paint and Varnish Technologists.

Representatives of both the Paint and Varnish Society and OCCA met to discuss the project and, in 1922, a Provisional Council was set up with Mr. S. K. Thornley (a noted paint manufacturer) as Chairman, Dr. Newton-Friend (our oldest surviving Past-President) as Vice-Chairman, Mr. A. J. Jennings

(a publisher deeply interested in the Paint and Varnish Society) Treasurer, and Mr. H. D. Bradford (Paint and Varnish Society) and Mr. H. A. Carwood (OCCA) joint secretaries. A Memorandum and Articles of Association was printed, a document of special interest in view of recent discussions.

One of the objects read thus :

To establish and vary from time to time examinations or other tests of candidates for admission to the Institute to prove their technical and professional qualifications in the said trades or industries."

Another said, in part:

To promote and carry out research . . . to establish and maintain laboratories . . .

Membership would have been in five classes :

- (1) Fellows, (2) Associates, (3) Ordinary Members,
- (4) Hon. Members, (5) Student Members.

The Memorandum and Articles of Association, a letter and a ballot paper were sent to all members of OCCA but only 62 voted out of a membership of 200-250, and of the 62 who voted 44 were in favour and 18 were against. As the rules of the day said a majority of at least three-fourths was necessary to change the Association the proposal was abandoned. However, yet another seed had been planted, the conception of a Research Association.

Sections

Today OCCA has Sections throughout the United Kingdom, in Australia, New Zealand and South Africa.

The First Section to be formed was in Manchester in 1925. It continued to be the only Section until the Scottish Section was inaugurated in 1934. At this point the Association held meetings in London and the Sections in their own centres, but soon it was felt that there should be a Section in London. This was formed and held its first meeting in 1938.

Now we are arriving at the period of the Second World War and many will be familiar with the expansion in Sections which was a direct result of that War.

All members outside the areas of the Manchester and Scottish Sections were in the London Section. Obviously, due to air raids, meetings covering such a large part of the country were difficult, so a "Regional Emergency Scheme" was started, a product of the brains of the Chairman and the Hon. Secretary of the London Section, Dr. H. W. Keenan and Mr. David E. Roe.

Enthusiasts in many areas soon felt the need to start Sections. The first was born in Newcastle (in 1942), a second in Hull (in 1943), a third in Bristol (1944). Since the war others have followed ; Midlands (1948) and West Riding (1953).

Abroad, Australia started a Section in 1946 and that has grown until today OCCA has Sections in five States and a co-ordinating Federal Committee. South Africa came next (1948) and then New Zealand (1950), with Sections now in Wellington and in Auckland.

Some Sections have Branches. The London Section has two, the Southern Branch (1960) and the Thames Valley Branch (1964). The Bristol Section has one, the Irish Branch (1961), the Midlands Section has the Trent Valley Branch

(1964) and the Scottish Section, the Eastern Branch (1963). These Sections clearly show the great expansion of the Association.

Mention has been made of an early membership of about 200 ; just before the war the target was 1,000 ; today the total is over 4,000 !

The first Exhibition

OCCA Conferences are held biennially. Do you know the date of the first? It was held in Buxton in 1937 ; the second was held in Harrogate in 1939. The first consisted of diverse papers but the second concentrated on one subject—Varnish.

Perhaps it will surprise many that the first OCCA Technical Exhibition was held during the Harrogate Conference. It was not big, thirteen firms taking part, using a section of the Hotel for their displays.

I have briefly sketched the history of the Association, passing swiftly through a period of sixty years, if one adds the period “ Before the Beginning.” More can be seen when the History is published, and having spent many hours in reading OCCA records, perhaps I may close with a thought I expressed when I wrote an Introduction to the History. “ Wherein,” I asked, “ lies the secret of OCCA’s undoubted success? ” Having studied the years between, I came to the conclusion that it could not be truly put down to any one individual or to any one circumstance. The success, a great success, has been due to the combined efforts of many, all giving their utmost to a common cause.

Use of the CSIRO viscosity ratiometer with resinous materials

By J. K. Haken,

Department of Polymer Science, The University of New South Wales, Kensington, N.S.W., Australia.

Summary

An evaluation of the Viscosity Ratiometer developed by the Commonwealth Scientific and Industrial Research Organisation, as a control instrument for resinous materials has been carried out. While the instrument is sensitive to changes in viscosity and density and records the product of these two properties, the density variations of similar materials as were examined is relatively small and a close approximation of the ratio of the viscosities is obtained.

The viscosities of the samples examined are essentially independent of the rate of shear, the effect of solvent evaporation is studied by considering three series of readings using media containing no solvent, a low volatility solvent and a high volatility one. In all cases Ratiometer readings are readily obtained and comparison with ratios calculated from The Brookfield Viscometer shows that in each case a R.M.S. deviation of approximately 5 per cent occurred.

L'emploi du "viscosity ratiometer" CSIRO—un mesureur de rapport —pour contrôler la viscosité des matériaux résineux

Résumé

On a examiné, au point de vue d'un instrument de contrôle des matériaux résineux, le "viscosity ratiometer" mis au point par l'Organisation des Recherches Scientifiques et Industrielles du Commonwealth. L'instrument est sensible à la fois aux changements de viscosité et de densité, dont il enregistre le produit de ces deux propriétés. Les variations de la densité des matériaux semblables—tels qu'on a examiné—sont relativement faibles. Par conséquent on obtient une approximation assez proche au rapport des viscosités.

Les viscosités des échantillons examinés étaient essentiellement indépendantes du taux de cisaillement. On a étudié l'effet de la perte par évaporation du solvant au moyen de trois séries de lectures sur des liants contenant respectivement ; aucun solvant ; un solvant de faible volatilité ; un solvant de volatilité élevée. En chaque série les lectures de " ratiometer " sont obtenues facilement, et en comparaison des rapports calculés à l'aide du " Brookfield Viscometer " elles montraient une déviation approximative de racine de la moyenne de 5 pour cent.

Die Anwendung des CSIRO Viskositäts-Ratiometers für Harzartige Stoffe

Zusammenfassung

Das von der Commonwealth Scientific and Industrial Research Organisation als Kontrollinstrument für harzartige Stoffe entwickelte Viskositäts—Ratiometer wurde auf seine Brauchbarkeit hin untersucht. Obwohl dieses Instrument gegen Wechsel in Viskositäten und Dichten empfindlich ist und das Produkt dieser beiden Konstanten registriert, sind die Schwankungen in den spezifischen Gewichten ähnlicher, einer Prüfung unterworfenen Stoffe verhältnismässig gering. Man erhält für die Viskositäten sehr nahe beieinander liegende Werte.

Die Viskositäten der geprüften Muster waren im Wesentlichen vom Scherungskoeffizienten unabhängig ; der Einfluss, der durch die Verdunstung von Lösungsmittel ausgeübt wird, wurde untersucht, wobei drei Reihen von Ablesungen in Betracht gezogen wurden : unter

Einsatz von Bindemitteln, die einerseits kein Lösungsmittel, andererseits in einem Falle ein langsam, im anderen ein schnell verdunstendes Lösungsmittel enthielten. Die Ratiometer—Ableseungen waren in allen Untersuchungen ohne Schwierigkeiten erhältlich, und ein Vergleich mit den mittels des Brookfield Viskosimeters berechneten Werten zeigte, dass in jedem einzelnen Falle eine R.M.S.-Abweichung von annähernd 5 Prozent vorlag.

Introduction

The CSIRO Viscosity Ratiometer was designed and a prototype constructed several years ago by W. A. Caw of the National Standards Laboratory, Commonwealth Scientific and Industrial Research Organisation, Sydney.

The instrument consists of an equal arm balance with the side knife edge set in a plane below the centre knife edge. From each end of the beam hangs a stainless steel plate which terminates in a tail. With the plates in position and dry, the balance is adjusted to be aperiodic, i.e. to have no preferred rest position.

Consequently, the angular position of the balance when loaded is a direct measure of the ratio of the loads.

Two vessels are located on a table which can be used to immerse simultaneously and withdraw the plates hanging on the balance arms. When the plates are immersed in the liquids and withdrawn simultaneously the liquids drain from the plates. The mass of liquid adhering to a plate at any time after the commencement of drainage depends on the time and the geometry of the plate. It is proportional to the square root of the product of the viscosity and the density of the liquid masses and can be scaled to read the ratio of the viscosities directly.

Any pair of liquids of viscosity greater than about 100 centipoise can be compared, if the ratio of their viscosities is within range of 4/1 to 1/4. The quantity measured is the density multiplied by the dynamic viscosity.

The theoretical considerations of the instrument and of viscosity determination by the drainage of liquids from metal surfaces are described in Appendix I. A commercial model of the instrument has been produced by A. L. Franklin Pty. Ltd., Brookvale, N.S.W. and is shown in Figure 1.

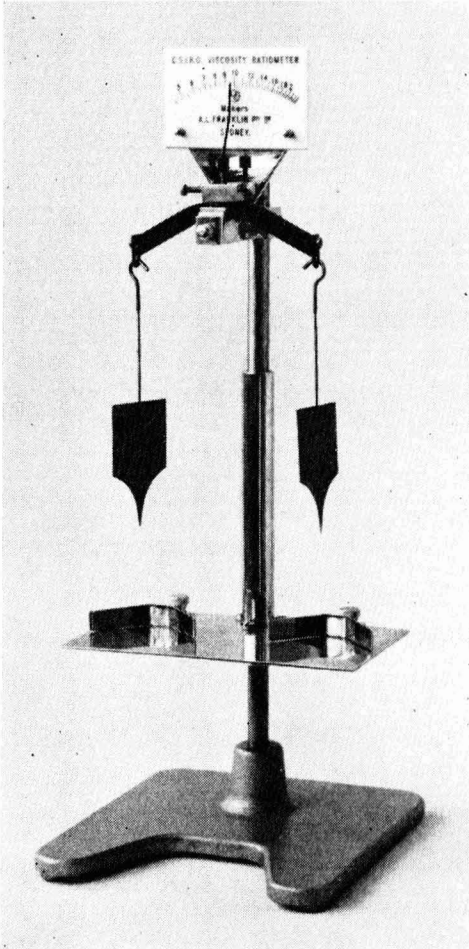


Fig. 1. The CSIRO viscosity ratiometer

The ratiometer, because of its simplicity and ease of operation, has been suggested as a control instrument in the testing of surface coating materials. It

has at present found some acceptance as a means of control of dip tank operations and of mineral oil processing. This work is restricted to resinous materials but the conclusions should be equally applicable to other materials providing that where considerable variations in density occur allowance is made.

The resin manufacturing industry in Australia currently uses both the Brookfield Viscometer and Bubble Tube Viscometer as control instruments. The value of the Brookfield Viscometer is unquestioned provided that it is realised that as a precision instrument it must be carefully used. While bubble tube viscometers principally of the Gardner Holdt type have long been used, their limitations are well known; using the alphabetical system accurate recording of small viscosity differences is not possible and when the time of motion of a bubble between two fixed points is recorded the probable percentage error is large. The mechanical disadvantages of filling and cleaning the tubes also the breakage and losses of tubes and stopwatches are well known.

Experimental

To calibrate the instrument the weights supplied having square root ratios (2.0 and 1.414 grams) are used. When in correct adjustment the arm loaded with the 1.414 gram weight will register 0.5 or 2.0 on the scale. Two plates of equal dimensions are provided which may be used to measure ratios ranging from 2.0 to 0.5. One of these plates may be used with a third (smaller) plate for ratios ranging from 4.0 to 1.0.

Twenty-five samples of polymerised linseed oil and five samples each of four alkyd resins were examined, the viscosity of each sample was determined using a Brookfield Viscometer, Model RVT and Ratiometer readings for various combinations were made using the prototype instrument.

Temperature control was achieved by prior storage of the instruments and samples in the controlled testing room which was maintained at 77°F. Viscosities measured with Gardner Holdt Tubes were not made as the accuracy of ratios from such measurements was very low.

The majority of Ratiometer determinations were carried out using the two similar plates allowing measurements within the ratios 2.0 to 0.5. This was done as the envisaged use was the comparison of relatively small viscosity differences. With the use of one small and one large plate, a greater viscosity range is possible but greater density variations are experienced.

The ratiometer determinations were conducted using 250 ml. conical beakers while the Brookfield readings were made using a wider container to minimise edge effects.

The effect of increased rates of shear was examined by testing samples from within each of the groups.

The effect of solvent evaporation was studied by examination of the alkyd samples, these being :—

1. High viscosity linseed oil alkyd. 50 per cent oil length. 50 per cent solids in white spirits.
2. Medium oil castor alkyd. 50 per cent oil length. 50 per cent solids in toluol.
3. Short oil coconut alkyd. 43 per cent oil length. 70 per cent solids in toluol.
4. Long oil linseed alkyd. 65 per cent oil length. 70 per cent solids in white spirits.

Results

The results obtained are shown in table 1 for the linseed oil samples and table 2 for the alkyd samples, Groups 1, 2, and 3 representing the first three resins previously described.

The effect of evaporation of different solvents is shown in table 3 where comparison is made of resins 3 and 4 containing white spirits and toluol respectively as solvents.

The variation of the ratio reading during draining was carefully observed, ample time elapsing with each determination to allow the reading to be made. With the oil samples and the alkyd in white spirits, a slight oscillation occurred immediately after withdrawal followed by a stationary period of 20-30 seconds with the balance then being further influenced by the plate immersed in the more viscous material. The solutions in toluol followed a similar pattern with the stationary period being reduced to 5-15 seconds and with the following alteration being more rapid.

Table 1

Resin No.	Brookfield Viscometer		Specific Gravity at 20°C		Brookfield Ratio	Ratiometer Reading	Ratio 6/7
	1 cps	2 cps	1	2			
1	128	148	0.9359	0.9368	1.15	1.03	1.12
4	128	196	0.9359	0.9388	1.53	1.60	0.96
3	128	182	0.9359	0.9382	1.42	1.47	0.97
5	128	250	0.9359	0.9412	1.95	1.90	1.03
2	128	176	0.9359	0.9379	1.375	1.40	0.98
6	264	128	0.9417	0.9359	0.48	0.50	0.96
7	264	283	0.9417	0.9427	1.07	1.10	0.97
8	264	506	0.9417	0.9522	1.91	1.85	1.03
9	560	623	0.9533	0.9539	1.11	1.05	1.06
10	590	560	0.9536	0.9533	0.95	0.95	1.00
11	590	780	0.9536	0.9552	0.75	0.73	1.03
12	590	780	0.9536	0.9552	1.32	1.40	0.94
13	590	1200	0.9536	0.9582	2.04	2.00	1.02
14	780	1200	0.9552	0.9582	1.53	1.47	1.04
15	1200	780	0.9582	0.9552	0.65	0.60	0.18
16	1200	1580	0.9582	0.9607	1.31	1.25	1.05
17	1525	2340	0.9603	0.9660	0.65	0.60	1.08
19	1580	1200	0.9607	0.9582	0.76	0.73	1.04
20	1580	2380	0.9607	0.9661	1.56	1.50	1.04
21	1580	2460	0.9607	0.9663	1.55	1.60	0.97
22	1748	2380	0.9618	0.9661	1.35	1.40	0.96
23	2308	1410	0.9657	0.9596	0.61	0.60	1.02
24	2380	1580	0.9663	0.9607	0.66	0.60	1.10
18	1525	2340	0.9603	0.9660	1.53	1.50	1.02
25	2650	4225	0.9668	0.9682	1.59	1.53	1.04
26	4225	2650	0.9682	0.9668	0.63	0.65	0.97

Mean 1.02
R.M.S.D.
4.7%

Conclusion

The results in general do not differ markedly from the ratios obtained with the Brookfield Viscometer and are within the limits of 5 per cent variation as claimed, the limiting factor would appear to be the size and graduation of the scale. It seems likely that the instrument may well find some measure of acceptance as a control device due to its ease of operation.

Acknowledgments

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Appendix

Principle and method of operation of the CSIRO ratiometer

Principle

The Ratiometer consists of an equal arm balance with the side knife edges set in a plane below the centre knife edge and is designed to compare the viscosities of two samples of liquid at room temperature. Two plates are immersed in the standard and test sample and then withdrawn simultaneously. The liquids drain from the plates and the deflection of the balance is a measure of the ratio of the masses of the samples adhering to the plates at any instant. The mass adhering to a plate, M , decreases with time according to the following equation :

$$M = K(\eta Pt),$$

where η = dynamic viscosity

P = density

t = draining time

K = a constant, depending on gravity and the plate dimensions.

For two similar plates

$$\frac{\eta_1 P_1}{\eta_2 P_2} = \left(\frac{M_1}{M_2} \right)^2$$

The quantity measured is the product of the density and the dynamic viscosity, but if the materials to be compared are of similar density as batches of a resinous media then a simpler relationship is possible.

The test sample may have a viscosity of 2.0 to 0.5 that of the standard sample when plates of equal size and weight are used. As the ratio of viscosities is proportional to the square of the ratio of the weights the range of application may be increased from 2.0 to 0.5 to 4.0 to 1.0 or 1.0 to 0.25 by the use of the plates whose weight are in the ratio of 2 to $\sqrt{2}$ or vice versa.

The level of viscosity at which the instrument may be used extends from approximately 100 centipoise, below which the draining time is inconveniently short, up to the order of 10,000 or 100,000 centipoise, above which difficulty may be experienced in immersing the plates.

Operation

The samples in suitable containers, i.e. 200 ml. tall pyrex beakers, are located on the adjustable platform. With the balance clamped, the platform is raised until the liquid covers the plates. The platform is then lowered at a convenient speed, such, that a reasonably thick film forms and until the tails are almost out of the liquid.

The beam of the balance is then released and as soon as the scale comes to rest a reading may be taken. In general the reading will remain constant until the liquid stops running smoothly and begins to drip.

Construction

The instrument as shown in Figure 1 has a cast iron base, hammer finished and the other parts as appropriate are chromium plated or polished. The instrument is supplied in a metal case suitable for storage and transporting.

The use of mechanical tests in predicting surface coating performance^{*}

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Summary

While broad predictions concerning surface coating performance are possible from theoretical considerations, it is essential to supplement these predictions with rapid and accurate methods of test. In this respect, the measurement of mechanical properties in preference to conventional methods of test is discussed.

Load-extension tests on detached films and direct-tension tests on films attached to substrates are described which enable changes in cohesive and adhesive characteristics of surface coatings to be observed.

The selected tests should be applied to both new, unexposed and aged, exposed films. Thus, knowledge of the rates of change in mechanical properties of surface coatings after relatively short periods of exposure in selected environments may yield forecasts of their durability.

The tests enable surface coatings to be screened rapidly and allow the early rejection of inherently unsuitable materials; they are valuable also in assisting with typical development problems, for example, formulations, applications, selection of substrates and treatments thereon.

L'Emploi des essais mécaniques pour prévoir le rendement des revêtements

Résumé

Tandis qu'il est possible de faire des prédictions en général à l'égard du rendement d'un revêtement, il est essentiel, néanmoins, de renforcer ces prédictions par des essais rapides et exacts. Sous ce rapport on discute l'avantage des essais basés sur le mesurage des propriétés mécaniques contre les méthodes d'essais conventionnelles.

L'auteur décrit à la fois des essais sur films détachés où l'on mesure le prolongement produit par une charge appliquée, ainsi que des essais de tension sur films attachés aux subjectiles. Ces deux types d'essais permettent l'observation des variations en les caractéristiques adhésives et cohésives de revêtements.

Les essais choisis doivent être appliqués également aux films neufs, c'est-à-dire sans vieillissement, et à ceux qui ont été vieillis. Ainsi une connaissance des taux de changement en les propriétés mécaniques de revêtements après des périodes relativement brèves de vieillissement en milieux choisis peut donner une prévision de leur durabilité.

Les essais permettent de sélectionner rapidement des revêtements et aussi de faire rejeter promptement des matériaux mal adaptés d'une manière inhérente. Les essais sont aussi de valeur en ce qui concerne la solution des problèmes typiques du développement des revêtements, par exemple, la mise au point des formules et des emplois, la sélection des subjectiles et des traitements là-dessus.

* Part of this work is based on a Thesis entitled "The Development of Surface Coatings Resistant to Chemical, Thermal and Climatic Stress" accepted for The City and Guilds Insignia Award in Technology (1964).

Die Zweckmässigkeit Mechanischer Prüfmethode zur Voraussage des Verhaltens von Anstrichmitteln

Zusammenfassung

Zwar kann man aus theoretischen Erwägungen in grossen Zügen auf das voraussichtliche Verhalten von Anstrichmitteln im Gebrauch schliessen, es ist jedoch wichtig, dass solche Voraussagen durch schnelle und präzise Prüfmethode ergänzt werden. In der vorliegenden Arbeit wird deshalb das Messen von mechanischen Eigenschaften der Vornahme konventioneller Prüfmethode vorgezogen.

„Dehnungs-unter Belastung-Prüfungen“ an abgelösten Filmen und „direkte Spannungs Untersuchungen“ an Filmen, die mit dem Substrat verbunden sind, werden beschrieben, mit Hilfe deren Veränderungen in den kohäsiven und adhäsiven Merkmalen von Anstrichstoffen beobachtet werden können.

Es wird vorgeschlagen, die ausgewählten Prüfmethode sowohl mit unexponierten, wie auch mit gealterten, exponierten Filmen durchzuführen. Auf diese Weise dürfte es möglich sein, schon nach verhältnismässig kurzer Exponierung unter ausgewählten Prüfbedingungen Kenntnis von der Grösse der Veränderungen in den mechanischen Eigenschaften von Anstrichmitteln zu gewinnen und deren Dauerhaftigkeit vorauszusagen.

Solche Methode setzen den Prüfer in die Lage, Anstrichstoffe schellstens zu klassifizieren und grundsätzlich ungeeignete Produkte sehr bald abzulehnen; sie sind auch von Wert indem sie zur Klärung typischer Entwicklungsprobleme, wie z.B. der Formulierung, Anwendung, Wahl der Substrate und Vorbehandlung derselben, beitragen.

Introduction

In conventional surface coating applications, stresses imposed on the films are usually due to atmospheric exposure, for example, fluctuations in temperature and humidity which impose relatively small stresses slowly, and mechanical shocks such as abrasion and impact which give sudden large stresses. Meanwhile, in daylight in the presence of oxygen, chemical changes take place which eventually degrade the film. Additional stresses imposed due to the effects of, for example, chemical environment, extremes in temperature and high intensity ultra-violet radiation, will be of increasing importance in many present-day and future applications. When the strains due to imposed stresses exceed what a film can accommodate it may crack or craze (loss of cohesion), peel or blister (loss of adhesion) or flake (loss of both cohesion and adhesion).

Conventional methods of assessing the durability of surface coatings are to expose them (a) outdoors for long periods (2 to 4 years) when the results depend on the nature of the climate at the exposure site, (b) to accelerated weathering cycles, e.g. DEF 1053 Method 26, when the results cannot at present be considered reliable as the carbon arc employed does not emit radiation comparable with sunlight, or (c) to trials in which one particular degrading influence is accentuated, e.g. salt spray or humidity condensation at elevated temperatures. After exposure to these or similar trials coatings are examined visually, e.g. loss of gloss, corrosion, blistering, and by simple mechanical tests, such as bending, scratching, and impact, which measure combinations of hardness, adhesion, cohesion and flexibility. These tests are valuable inspection methods but suffer from the disadvantage that they do not measure fundamental properties, nor are they sufficiently sensitive to detect small changes or incipient breakdowns which occur early in the life of a film.

Other tests used to examine surface coating behaviour in thermal and chemical environments include: Determinations of weight-losses of the film after ageing

at elevated temperatures. Although films which degrade by excessive loss of substance are unsuitable as their protective properties would rapidly deteriorate, films exhibiting low weight-losses on heating may also be unsuitable due to deterioration in mechanical properties, e.g. embrittlement.

The overall effects of chemicals may be determined by immersing coated test specimens in various reagents and assessing their breakdown visually. Tests of this kind give useful guides to the severity of attack at an early stage ; however, films of poor appearance may continue to maintain good mechanical properties ; volume and weight changes may also be determined. It is possible, however, for material to be removed from a film (e.g. plasticiser) and for this to be replaced by a similar quantity of absorbing solution. Consequently the mechanical properties of the film will have deteriorated.

Thus, the use of test methods which would predict, at an early stage, the ability of a film to withstand or recover from the effect of stresses after prolonged exposure would be a valuable means of accelerating the development of improved surface coatings.

The main objectives of the present work were to consider the use of suitable mechanical tests in preference to conventional methods of assessment and to :

- (a) Evaluate a selection of unexposed film-forming polymers, including traditional surface coatings, e.g. oil-modified alkyds, together with newer coatings, e.g. epoxide, polyurethane, silicon and fluorine containing polymers.
- (b) Assist with typical development problems including formulations, exposure trials.
- (c) Attempt to forecast the durability of surface coatings after periods of exposure out of doors shorter than for conventional visual assessments.

Mechanical properties of surface coatings

Polymers have some of the characteristics of both liquids and solids ; thus coating films belong to the class of materials showing visco-elastic behaviour.

Mechanical models consisting of ideal springs and dashpots are often useful in illustrating the behaviour of polymers under stress as they provide a picture of spacing, uncoiling and slipping of the polymer molecules. Although models suffice to explain the general character of simple polymer systems, surface coatings, being non-homogeneous, are more complex. They often contain rigid particles of pigment dispersed in polymeric media and consist of stratified layers, the region of the film exposed to the atmosphere retaining less solvent and possibly being more cross-linked than at the coating layer/substrate interface. Between these two extremes there are strata which are largely responsible for the bulk mechanical behaviour of the film. Interpretation of the mechanical behaviour of surface coating polymers is difficult, as they have unspecified molecular units of flow and a wide distribution of retardation times ; hence additional springs and dashpots become necessary to represent the systems and calculations are involved and tedious. The theoretical significance of such models and their mathematical interpretation are fully discussed by Alfrey¹ and Eirich².

The temperature, environment and rate at which stresses are applied to a polymer are very important. There are distinctly different regions of visco-elastic behaviour which are summarised in Figure 1, e.g. glass-like, rubbery-plastic, rubbery-liquid and liquid. The extent and kind of motion which polymer molecules undergo indicates whether they are plastic or rubbery in the solid state.

Rate at which stresses are applied	Temperature	Mechanical behaviour of polymer
<p style="text-align: center;">High</p> <p style="text-align: center;">↑</p> <p style="text-align: center;">Increasing rate of stressing</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">Low</p>	<p style="text-align: center;">Low</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">Increasing temperature</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">High</p>	<p>Glass-like behaviour, molecular chains are frozen, i.e. viscosity in dashpot is too high to allow movement, therefore response is elastic. Polymer films would be expected to show increased Young's modulus, yield strength and tensile strength. Extension at break decreases for cross-linked polymers but may increase for elastomers.</p>
		<p>Transition region, both elastic and viscous mechanisms operate. Young's modulus, yield stress and strain and tensile strength decrease, extension at break usually increases.</p>
		<p>Rubbery-plastic, rubbery-liquid region, segments of molecular chains are free to move and response is predominantly viscous. Young's modulus, yield stress and strain, tensile strength decreases. Extension at break may go through a maximum and then decrease.</p>

Fig. 1

Cohesive properties

One practical way of assessing the cohesive properties of surface coatings is to examine them as detached films, thereby eliminating the adhesion factor. Methods of interest include : creep, stress-relaxation^{3,4} and stress/strain (load/extension tests)^{5,6,7}.

Load-extension tests were used in the present work ; methods of preparing detached films and the method of test are described in the Appendix. Surface coatings producing load-extension curves described in Table 1 would be expected to show the properties indicated.

The load-extension properties of an ideal surface coating are indicated in (v) Table 1. Coatings of this type would allow the stresses set by differential dimensional changes and stress concentrations to be dispersed.

However, it is important that not only should the film develop these desirable mechanical properties shortly after application, but should also retain them during prolonged exposure.

Table 1

Measured mechanical property	Anticipated properties
(i) Low modulus of elasticity, low yield stress, low extension at break, low tensile strength.	<i>Soft, weak films</i>
(ii) High modulus of elasticity, no well defined yield stress, low extension at break, moderate tensile strength	<i>Brittle films</i>
(iii) High modulus of elasticity, high yield stress, moderate extension at break, high tensile strength.	<i>Hard, strong films</i>
(iv) Low modulus of elasticity, low yield stress, high extension at break, and moderate tensile strength.	<i>Soft, tough films</i>
(v) High modulus of elasticity, high yield stress, high extension at break, high tensile strength.	<i>Strong, tough films</i>

Adhesive properties

Although a surface coating may possess excellent cohesive properties it will offer little protection during exposure unless it also adheres to the substrate. Adhesion may be divided into two main classes, specific adhesion and real or practical adhesion. Specific adhesion is attributed to or caused by the attraction of molecules for one another—this includes electrostatic bonds, covalent bonds, metallic bonds and Van der Waals' forces.

Theoretical considerations suggest the forces available from most organic materials used as surface coatings are capable of providing joint-strengths greater than those obtained in practice.

Various practical factors which cause loss in theoretical joint-strength have been summarised by Reinhart⁸. With surface coatings they include loss of strength due to incomplete wetting and contamination of the substrate by, for example, oxide layers, oil, grease, dirt, adsorbed gases and vapours. Further losses may be due to internal stresses within the films which occur during stoving or solvent release; additional losses may be due to voids within the coating and limitations of the method of test.

Methods used to determine practical adhesion characteristics of surface coatings include:

(i) The detachment of the coating by its own inertia, for example, the high speed rotor⁹, ultra centrifuge¹⁰, and "Adhesion Gun"¹¹ techniques.

(ii) A blister is formed by injecting liquid under pressure between the coating and substrate¹².

(iii) A force is applied to the free surface of a coating by pulling on a test-piece bonded to the dried coating with a suitable adhesive. In this method the planar surface of a coated cylindrical test-piece or disc removed from a test-panel is bonded to a second untreated test-piece. The assembly is placed in a tensometer, the force required to fracture the joint is determined either in direct-tension, shear or torsion.

A direct-tension method, known as the "pull-off" test¹³, with certain minor modifications is adopted in the present work. The method gives a practical value for adhesion provided the cohesion of the film exceeds its adhesion to the substrate, (otherwise the cohesive strength of the film is measured). The adhesive should not react with the coating and its cohesive strength should be greater than that of the coating. Thus, the apparent character of surface coating failures, determined by the above techniques are either loss of adhesion between the surface coating and the substrate or loss of cohesion within the film. Recent investigations^{14, 15} however, suggest that true adhesive failures are unlikely and are really cohesive failures in close proximity to the coating substrate boundary layers.

However, for practical purposes, adhesion characteristics assessed by the above technique are in this report interpreted as follows: adhesive failures are reported when the film is removed from the substrate to such an extent that it no longer protects it. Cohesive failures are reported if the joint breaks within the film or adhesive, leaving the film in a condition where it continues to give protection to the substrate.

Surface coatings failing at the joint-strengths with the types of failure described in Table 2 would be expected to show the adhesive characteristics indicated.

Table 2

Measured joint-strength (to failure)	Type of failure observed	Adhesion characteristics of surface coating
Very low	Adhesive	Very poor
Low	Adhesive	Poor
Low	Cohesive	Fair
Medium	Adhesive	Fair
Medium	Cohesive	Moderate
High	Adhesive	Moderate
High	Cohesive	Good

EXPERIMENTAL METHODS

Preliminary examination of surface coatings

Since surface coatings are frequently of complex composition it was decided to restrict the preliminary work to the materials common to most coatings, viz. unmodified polymer films.

Selection of film forming polymers

A comprehensive range of current and potential film-forming materials listed in Table 3 were selected for examination. The method of preparation is described in the Appendix.

Films 10-30 microns thick, were prepared from two main groups of materials:

- L.1-18* Essentially linear, high polymers from dispersions in non-solvents, cast or extruded film, or as the majority, by spinning on to tin panels from solutions with solids contents of 15-25 per cent in organic solvents.

C.1-14 Relatively low molecular weight components, i.e. resins, oligomers, capable of reacting to form cross-linked films by spinning from solutions with solids contents of 40-50 per cent in organic solvents.

Table 3
Materials selected for evaluation

Type	Code No.	Polymer, or main film forming constituents
Linear	L. 1	Polytetrafluoroethylene
	L. 2	Polyethylene terephthalate
	L. 3	Polychlorotrifluoroethylene
	L. 4	Polyhexamethylene adipamide
	L. 5	Polyvinyl fluoride
	L. 6	Polyethylene
	L. 7	Polychloroprene
	L. 8	Polyvinyl chloride
	L. 9	Cellulose nitrate
	L.10	Polystyrene
	L.11	Polyvinyl acetate
	L.12	Polymethyl methacrylate
	L.13	Poly (n-butyl) methacrylate
	L.14	Polyvinyl butyral
	L.15	Copolymer vinylidene fluoride and hexafluoro-propylene ethylene
	L.16	Copolymer vinylidene fluoride and chlortri-fluoroethylene
	L.17 (a-e)	Vinyl chloride and vinyl acetate copolymers
	L.18	Copolymer methyl methacrylate and ethylacrylate
Cross-linking	C. 1 (a-h)	Oil modified alkyds
	C. 2	Tung oil—phenolic, i.e. p'phenyl phenol-formaldehyde (50 per cent oil-length)
	C. 3	Dehydrated castor oil—epoxide ester (40 per cent oil-length)
	C. 4	Epoxide resin, polyamide resin (1:1) blend
	C. 5	Epoxide resin, polyamine (9:1) adduct
	C. 6	Epoxide resin, polysulphide resin blend (1:1), amine cured
	C. 7	Epoxide resin, phenolic, i.e. p'terst-butyl phenol-formaldehyde resin (7:3) condensate
	C. 8	Polyurethane, [polyester ; diisocyanate (7:3)]
	C. 9	Polyurethane, [polyester ; epoxide ; diisocyanate (3.5:3.5:3.0)]
	C.10	Epoxide-acrylic copolymer
	C.11	Modified silicone, polymethylphenyl silicone, Epoxide (5.5:4.5) polyamide cured.
	C.12	Polymethylphenyl silicone
	C.13	Tung-oil, rosin-glycerol ester, (45 per cent oil-length)
	C.14	Dehydrated castor-oil, -modified phenolic (45 per cent oil-length)

Films containing external plasticisers were avoided. More desirable were films which possessed the attributes of plasticised systems resulting from structural features of the polymer acting as an internal plasticiser. Cross-linking agents, catalysts or the application of heat were permitted to allow normal film-formation.

Preliminary examination of films

After storage at room temperature for 14 days the cohesive and adhesive characteristics of selected films were assessed. The results are recorded in Table 6. The methods of test are described in the Appendix.

Cohesion

Cohesive properties of the films were determined by load-extension tests on detached films at a constant rate of extension and were rated according to the arbitrary classifications listed in Table 4.

Table 4

Tensile Strength at break g/sq. mm	Extension at break (per cent)	Cohesion Rating
< 500	< 20	Weak
> 1000	< 7.5	Brittle
> 1500	> 7.5 < 20	Hard and strong
> 500 < 1500	> 20	Soft and tough
> 1500	> 20	Strong and tough

Adhesion

Adhesive properties of the films to mild steel substrates were determined by the direct-tension method described in the Appendix. Mild steel was chosen as being representative of the surface most widely used in practice. The adhesion characteristics of the films were classified according to the arbitrary ratings listed in Table 5.

Table 5

Joint Strength g/sq. mm	Type of failure	Adhesion rating
< 500	Adhesive	Very poor
< 1000	Adhesive	Poor
< 1000	Cohesive	Fair
> 1000 < 2000	Adhesive	Fair
> 2000	Adhesive	Moderate
> 1000 < 2000	Cohesive	Moderate
> 2000	Cohesive	Good

Table 6 (a)
Mechanical Properties of Unexposed Films Prepared from Linear Polymers

No.	Polymer film	Method of drying	Cohesive properties of detached films						Adhesion to mild steel			
			Young's modulus (g./sq. mm. $\times 10^3$)	Tensile strength (g./sq. mm.)		Extension (%)		Maximum strain energy (g.-mm./sq. mm. $\times 10^3$)	Rating	Joint strength (g./sq. mm.)	Major type of failure	Rating
				at yield	at break	at yield	at break					
L.1	Polytetrafluoroethylene	air	17	(1) 1,800	(1) 180	(1) 12	(1) 45	210	strong and tough	(1)	(1)	(1)
L.2	Polyethylene terephthalate	air	210	10,250 10,650	12	45	320	strong and tough	(1)	(1)	(1)	(1)
L.3	Polychlorotrifluoroethylene	air	135	4,250 8,000	10	350	1,800	strong and tough	(1)	(1)	(1)	(1)
L.4	Polyhexamethylene adipamide	air	36	(1) 5,000	(1) 325	(1) 3.5	1,000	strong and tough	(1)	(1)	(1)	(1)
L.5	Polyvinyl fluoride	air	140	3,250 11,250	3.5	150	1,000	strong and tough	(1)	(1)	(1)	(1)
L.6	Polyethylene	air	12	550 1,500	15	550	600	soft and tough	(1)	(1)	(1)	(1)
L.7	Polychloroprene	air	16	575 1,050	5	430	300	soft and tough	1,050	cohesive	moderate	
L.8	Polyvinyl chloride	air	130	(1) 4,250	(1) 4	(1) 7	7	brittle	200	adhesive	very poor	

Table 6a (continued)

No.	Polymer film	Method of drying	Cohesive properties of detached films						Adhesion to mild steel				
			Young's modulus (g./sq. mm $\times 10^3$)		Tensile strength (g./sq. mm)		Extension (%)		Maximum strain energy (g. mm/sq. mm $\times 10^3$)	Rating	Joint strength (g./sq. mm)	Major type of failure	Rating
			at yield	at break	at yield	at break	at yield	at break					
L.9	Cellulose nitrate	air	200	4,500	(1)	3	5	2,000	adhesive	moderate			
L.10	Polystyrene ..	air	100	8,000	(1)	6	24	100	adhesive	v. poor			
L.11	Polyvinyl acetate ..	air	3	850	(1)	650	500	700	adhesive	poor			
L.12	Polymethyl methacrylate ..	air	85	5,750	(1)	7	20	400	adhesive	v. poor			
L.13	Poly n-butyl methacrylate ..	air	14	375	400	4	80	1,500	adhesive	fair			
L.14	Polyvinyl butyral ..	air	135	3,700	2,650	4	45	2,300	cohesive	good			
L.15	Copolymer vinylidene fluoride and hexafluoropropylene	air	(1)	200	(1)	1,200	120	350	adhesive	poor			
		4(h)	(1)	350	(1)	1,000	170	1,050	adhesive	fair			
L.16	Copolymer vinylidene fluoride and chlorotrifluoroethylene ..	air	(1)	510	(1)	550	140	300	adhesive	poor			
		4(h)	(1)	590	(1)	600	180	1,060	adhesive	fair			

Table 6a (continued)

No.	Polymer film	Method of drying	Cohesive properties of detached films						Adhesion to mild steel			
			Young's modulus (g./sq. mm $\times 10^3$)	Tensile strength (g./sq. mm)		Extension (%)		Maximum strain energy (g.-mm./sq. mm $\times 10^3$) toughness	Rating	Joint strength (g./sq. mm)	Major type of failure	Rating
				at yield	at break	at yield	at break					
L.17 (a)	Terpolymer vinyl-chloride 91 per cent vinyl acetate 3 per cent, VA 6 per cent	air	155	(1)	3,475	(1)	3	6	brittle	500	adhesive	poor
L.17 (b)	Copolymer vinyl-chloride 87 per cent VA 13 per cent ..	air	130		2,300	3	10	23	hard and strong	350	adhesive	v. poor
L.17 (c)	Copolymer vinyl-chloride 90 per cent VA 10 per cent ..	air	105	(1)	3,825	(1)	4	6	brittle	400	adhesive	v. poor
L.17 (d)	Terpolymer vinyl-chloride 86 per cent vinyl acetate 13 per cent MA 1 per cent	air	160	(1)	3,900	(1)	3	4	brittle	850	adhesive	poor
L.17 (e)	Terpolymer vinyl-chloride 84 per cent vinyl acetate 15 per cent MA 1 per cent	air	165	(1)	2,800	(1)	4	6		1,025	adhesive	fair
		$\frac{3}{4}$ (h) -125°C	170	(1)	3,000	(1)	3	5	brittle	1,800	adhesive	fair
L.18	Copolymer methyl methacrylate and ethyl acrylate ..	air	22		1,350	4	90	75	soft and tough	1,900	cohesive	moderate

Key: (1) = Value was indeterminate. VA = Vinyl alcohol. MA = Maleic anhydride.

Table 6b
 Mechanical properties of unexposed cross-linking films

No.	Polymer or main film-forming materials	Method of drying	Cohesive properties of detached films						Adhesion to mild steel			
			Young's modulus (g./sq. mm $\times 10^3$)	Tensile strength (g./sq. mm)		Extension (%)		Maximum strain energy (g.-mm./sq. mm $\times 10^3$) toughness	Rating	Joint strength (g./sq. mm)	Major type of failure	Rating
				at yield	at break	at yield	at break					
C.1 (a)	45 per cent oil-length, linseed oil, glycerol-phthalate alkyd ..	air	23	775	1,125	1	110	85	soft and tough	2,000	cohesive	good
C.1 (b)	55 per cent oil-length, linseed oil, pentaerythritol-phthalate alkyd ..	air	5	80	470	3	125	38	soft and tough	2,100	cohesive	good
C.1 (c)	50 per cent oil-length, linseed-tung oil (3:1), glycerol-phthalate alkyd ..	air	12	525	560	5	95	36	soft and tough	1,600	cohesive	moderate
C.1 (d)	70 per cent oil-length, soyabean oil, pentaerythritol-phthalate alkyd ..	air	4	75	525	3	65	24	soft and tough	2,500	cohesive	good
C.1 (e)	70 per cent oil-length, linseed oil, pentaerythritol-phthalate alkyd ..	air	8	125	650	2	65	25	soft and tough	2,500	cohesive	good

Table 6b (continued)

No.	Polymer or main film-forming materials	Method of drying	Cohesive properties of detached films						Adhesion to mild steel				
			Young's modulus (g/sq. mm $\times 10^3$)		Tensile strength (g/sq. mm)		Extension (%)		Maximum strain energy (g/mm/sq. mm $\times 10^3$) toughness	Rating	Joint strength (g/sq. mm)	Major type of failure	Rating
			at yield	at break	at yield	at break	at yield	at break					
C.1 (f)	50 per cent oil-length, linseed oil, isocyanate modified, glycerol-phthalate alkyd ..	air	50	1,450	1,750	8	35	45	Hard and strong	1,675	cohesive	moderate	
C.1 (g)	50 per cent oil-length, soyabean oil, epoxide modified glycerol-phthalate alkyd ..	air	20	1,200	1,400	6	120	101	soft and tough	2,200	cohesive	good	
C.1 (h)	60 per cent oil-length, linseed oil, styrene, epoxide, modified glycerol-phthalate alkyd ..	air	16	160	2,065	1	90	102	tough	2,600	cohesive	good	
C.2	p-phenyl phenol formaldehyde 50% tung oil ..	Air	63	1,800	1,400	6	25	35	soft and tough	1,600	adhesive	fair	
C.3	Epoxide 40% dehydrated castor oil ester	Air	35	675	1,225	55	95	80	soft and tough	2,100	cohesive	good	
C.4	Epoxide-polyamide 1:1 ..	Air	50	930	1,200	4	100	80	soft and tough	2,450	cohesive	good	

Table 6b (continued)

No.	Polymer or main film-forming materials	Method of drying	Cohesive properties of detached films						Adhesion to mild steel			
			Young's modulus (g./sq. mm. $\times 10^3$)	Tensile strength (g./sq. mm)		Extension (%)		Maximum strain energy (g./mm./sq. mm $\times 10^3$) toughness	Rating	Joint strength (g./sq. mm)	Major type of failure	Rating
				at yield	at break	at yield	at break					
C.4	Epoxide-polyamide 1:1	$\frac{1}{2}$ (h) 175°C	150	(I) 3,200	(I) 5	6	6	brittle	3,500	cohesive	good	
C.5	Epoxide-polyamine 9:1	$\frac{1}{2}$ (h) 175°C	200	(I) 4,500	(I) 3	6	6	brittle	3,500	cohesive	good	
C.6	Epoxide-polysulphide polyamine 5.0:4.5:0.5	Air	1	(I) 550	(I) 100	27	27	soft and tough	900	adhesive	poor	
C.7	Epoxide-phenolic 7:3	$\frac{1}{2}$ (h) 175°C	140	(I) 2,550	(I) 2	3	3	brittle	3,000	cohesive	good	
C.8	Drying oil-free polyester-polyurethane ..	$\frac{1}{2}$ (h) 175°C	210	(I) 4,250	(I) 3	6	6	brittle	2,000	cohesive	good	
C.9	Drying oil-free polyester-epoxide polyurethane	Air	47	1,300 1,800	3 20	29	29	hard and strong	2,200	cohesive	good	
C.9	Drying oil-free polyester-epoxide polyurethane	$\frac{1}{2}$ (h) 175°C	110	(I) 3,100	(I) 3	4	4	brittle	1,475	adhesive	fair	
C.10	Acrylic-epoxide ..	$\frac{1}{2}$ (h) 175°C	180	(I) 3,900	(I) 3	6	6	brittle	3,000	cohesive	good	

Table 6b (continued)

No.	Polymer or main film-forming materials	Method of drying	Cohesive properties of detached films						Adhesion to mild steel			
			Young's modulus (g/sq. mm $\times 10^3$)	Tensile strength (g/sq. mm)		Extension (%)		Maximum strain energy (g./mm./sq. mm $\times 10^3$)	Rating	Joint strength (g/sq. mm)	Major type of failure	Rating
				at yield	at break	at yield	at break					
C.11	Epoxide-polyamide silicone	$\frac{1}{2}$ (h) 175°C	50	(I)	2,400	—	3	2	brittle	3,250	cohesive	good
C.12	Polymethylphenyl silicone	4(h) 200°C	45	(I)	600	(I)	6	2	brittle	2,100	cohesive	good
C.13	45% oil-length tung oil resin glycerol ester.	Air	85	(I)	480	(I)	4.5	1.5	weak	1,250	cohesive	fair
C.14	45% oil-length dehydrated castor oil modified phenolic ..	Air	80	(I)	450	(I)	3.5	1.5	weak	1,325	cohesive	fair

Summarised results of preliminary examinations

The results of mechanical tests on unexposed surface coatings recorded in Table 6 (a) and 6 (b) may be summarised as follows :

Weak coatings would be unlikely to resist moderate expansion or contraction, impact, and abrasion. These included air dried films of oleoresinous materials formed by cross-linking (*C.13* and *C.14*). Although their adhesions to mild steel were satisfactory, this type of coating would not generally be recommended for outdoor exposure.

Brittle coatings would be more likely to resist scratching, but less resistant to abrasion, large expansion and contraction, especially at low temperatures. These included air dried films of linear polymers : (*L.9*) cellulose nitrate, (*L.10*) polystyrene, (*L.12*) polymethyl methacrylate, (*L.17a*, *L.17c-e*) vinyl chloride. vinyl acetate copolymers. However, poor adhesion indicates their unsuitability for direct applications to mild steel. On the other hand, brittle coatings formed by cross-linking included stoved films of (*C.12*) silicone modified epoxide resins. (*C.9*) Polyester polyurethane, (*C.4*) polyamide, (*C.6*) polyamine, (*C.7*) phenolic, (*C.10*) acrylic, (*C.11*) polyamide silicone had good adhesion to mild steel.

Hard, strong coatings with poor to moderate adhesion to mild steel, but likely to have superior resistance to abrasion, expansion and contraction compared to brittle coatings, were restricted to air-dried films of (*L.17b*) vinyl chloride, vinyl acetate copolymer (*C.1f*) isocyanate modified alkyd, (*C.9*) polyester, epoxide-urethane.

Soft, tough coatings likely to resist expansion and contraction, but probably less resistant to sudden shocks, e.g. abrasion and impact, especially at elevated temperatures, included air dried films of linear polymers : (*L.6*) polyethylene, (*L.7*) polychloroprene, (*L.11*) polyvinyl acetate, (*L.13*) poly-n-butyl methacrylate : (*L.15*) vinylidene fluoride hexafluoropropylene copolymer and (*L.16*) vinylidene fluoride chlorotrifluoroethylene, copolymer (*L.18*) methyl methacrylate and ethyl acrylate copolymer ; however, their adhesion to mild steel was generally poor. On the other hand, soft, tough films formed by cross-linking, included (*C.1*) oil-modified alkyds, (*C.2*) tung oil phenolic, (*C.3*) epoxide ester, (*C.4*) epoxide polyamide had good adhesion to mild steel.

Strong, tough films likely to resist most types of imposed stress were all formed from linear, high polymers. These included (*L.1*) polytetrafluoroethylene, (*L.2*) polyethylene terephthalate, (*L.3*) polychlorotrifluoroethylene, (*L.4*) polyhexamethylene adipamide, (*L.5*) polyvinyl fluoride, and (*L.14*) polyvinyl butyral. With the exception of polyvinyl butyral, which had good adhesion to mild steel, the remaining polymers, being insoluble in most organic solvents, would be unsuitable as surface coatings applied by conventional methods. Their possible use as dispersions in non-solvents and hot melts however, should not be overlooked.

In general, the results indicate that cohesive properties of surface coatings formed from linear polymers varied considerably, from, soft, tough films formed from amorphous polymers having irregular structures with weak to moderate intermolecular attractions or molecular stiffness, to strong, tough

films whose strength, ductility and insolubility is attributed to their having regular structures which are highly crystalline with strong intermolecular attractions and molecular stiffness.

The majority of films formed from linear polymers had indifferent adhesion to mild steel, this drawback being attributed to poor wetting and contaminant displacing properties of large molecules, which also, because of their lack of mobility, restrict the dissipation of stresses from within the films during release of solvent.

The majority of films having cross-links derived from atmospheric oxidation were soft and tough, these properties being attributed to the formation of relatively lightly cross-linked structures after short periods of drying in air. On the other hand, films containing cross-linking agents were brittle, especially when stoved.

The good adhesion of films formed by cross-linking are attributed to the mobility of relatively low molecular weight materials which, often, contain highly polar groupings on their structures e.g. carboxy groups on oil-modified alkyd resins. Their structures might therefore be capable of relaxation, thus allowing stress relief from within the films.

It is apparent that from knowledge of mechanical properties of their unexposed films, many surface coatings, having inherently unsuitable features, may be rejected at an early stage, thereby avoiding long-term exposure trials. However, it may also be misleading to select a surface coating for a specific application solely because of its outstanding mechanical properties initially, as rapid deterioration may occur during exposure.

Mechanical tests to assist surface coating development formulation

The surface coatings examined in the previous section were unpigmented films and undoubtedly their properties could be modified by changes in their formulations.

Load-extension tests have proved useful for studying typical development problems. For example, the effects of pigmentations (including optimum pigment vehicle concentrations) the effects of plasticisers and other additives. On the other hand, direct-tension tests have proved extremely valuable in examining film thickness, method of application, nature of substrates and surface treatments.

A specific example, which indicates how mechanical tests may assist with a typical development problem, was to establish the proportion of epoxide resin to use in epoxide/polyamide resins. Stoved films were compared with similar films dried in air, and solvented blends compared with solventless blends.

The results summarised in Table 7 indicate that the films became more brittle with increasing epoxide resin content as shown by their higher Young's moduli, with reductions in extensions at break. Stoved films were more brittle compared to similar air dried films, which suggests that stoved films were more highly cross-linked.

The best adhesions were usually obtained with blends containing the higher proportion of epoxide resin. The adhesion of epoxide/polyamide resins to mild

Table 7
Mechanical properties of solvented and solventless epoxide resin-polyamide resin blends

Type and percentage epoxide resin	Type and percentage polyamide resin	System.	Method of drying	Cohesion			Adhesion to				
				Young's Modulus (g./sq.mm) $\times 10^3$	Tensile strength at break (g./sq.mm)	extension at break (per cent)	Mild steel	Brass	Joint strength (g./sq.mm)	Major type of failure	Major type of failure
(Mol. wt.) (900) 67	(amine no.) (230) 33	Solvented*	air-14 days $\frac{1}{2}$ (h)-175°C	70	3,000	5	2,500	cohesive	1,300	adhesive	adhesive
(Mol. wt.) (900) 50	(amine no.) (220) 50	Solvented*	air-14 days $\frac{1}{2}$ (h)-175°C	45	2,300	100	2,450	cohesive	2,600	adhesive	adhesive
(Mol. wt.) (900) 33	(amine no.) (220) 67	Solvented*	air-14 days $\frac{1}{2}$ (h)-175°C	4	500	180	1,150	cohesive	1,450	adhesive	adhesive
(Mol. wt.) (300) 67	(amine no.) (320) 33	Solventless†	air-14 days	50	1,950	8	NT	—	NT	—	—
(Mol. wt.) (300) 50	(amine no.) (320) 50	Solventless†	air-14 days	70	3,600	6	900	adhesive	950	adhesive	adhesive
(Mol. wt.) (300) 33	(amine no.) (320) 67	Solventless†	air-14 days	5	400	110	1,850	cohesive	1,250	adhesive	adhesive

NT = No tests.

*Films prepared from solvented systems 20-30 microns thick.

†Films prepared from solventless systems 100-150 microns thick.

steel, where cohesive failures were observed, were better than their adhesion to brass, where adhesive failures occurred.

The cohesive properties of solvented and solventless epoxide/polyamide systems were similar, although the adhesion of films prepared from solventless blends, judged by their lower joint-strengths were usually inferior. The superior adhesion of films obtained from blends containing solvent may possibly be attributed to their lower film thickness and better wetting characteristics. The formulation finally selected, would naturally depend on the application and nature of anticipated stresses to which the film would be subjected.

Short term ageing trials

Mechanical tests are useful methods for observing changes in physical properties of surface coatings during short term ageing trials.

The following section describes the use of load-extension tests in examining the effects of immersion in petrol, and heat ageing at 40-50°C on a series of elastomeric surface coatings for possible use as proof coatings for fabrics. Preliminary investigations having previously confirmed their satisfactory adhesion for this type of application.

Petrol immersion

The changes in load-extension properties of detached films determined 10 minutes after withdrawal from a 70 : 30 iso-octane/toluene mixture are recorded in Table 8. The results show that films of a butadiene/acrylonitrile copolymer were only slightly weakened after immersion at 40 and 50°C. Only the epoxide/polyamide resins which contained the highest proportion of epoxide resin had satisfactory resistance, judged by retention of their original tensile strengths and extensions at break, but their films were considered too brittle compared with the elastomeric type of coating. Films containing a low proportion of epoxide resin to polyamide resin were very weak after immersion as shown by 60-75 per cent reductions of original tensile strength.

Heat ageing

Table 9 records changes in the load-extension properties of detached films 10 minutes after withdrawal from heating for 10 days at 40 and 50°C.

Neither the butadiene/acrylonitrile copolymer, polyurethane, or epoxide-polyamide were drastically affected by these conditions. Although the tensile strength of the butadiene/acrylonitrile copolymer increased, this may have been due to loss of solvent. On the other hand, films of polychloroprene were seriously degraded by these conditions (See also Figure 2). This result was surprising, as polychloroprene in bulk is known to have good thermal stability at 40-50°C. The poor heat stability of polychloroprene (2-chlorobutadiene-1, 3) has been attributed¹⁶ to oxidative degradation of vinyl groups formed by the 1, 2-polymerisation of polychloroprene. The results show the value of mechanical tests in predicting this possibility after short-term exposure trials. They also confirm the value of examining aged surface coatings and not relying entirely on data obtained for unexposed films.

Table 8
Effect of petrol immersion on load-extension properties of detached films

Nature of film	Exposure conditions		Mean mechanical properties			Percentage changes in mechanical properties		
	Time (days)	Temp (°C)	Young's modulus (g/sq. mm $\times 10^3$)	Tensile strength to break (g/sq. mm)	Extension at break (per cent)	Young's modulus	Tensile strength	Extension at break
Polyurethane	21 (control not exposed)	21	3.4	3,100	400	0.0	0.0	0.0
	14	40	4.2	2,175	290	+24	-30	-28
	.. 14	50	2.7	1,650	245	-20	-47	-40
Butadiene acrylonitrile copolymer	21 (control not exposed)	21	1.1	440	690	0.0	0.0	0.0
	14	40	0.7	435	600	-36	0.0	-13
	14	50	0.8	345	470	-27	-20	-32
Epoxide (2)	21 (control not exposed)	21	75.0	2,640	2.5	0.0	0.0	0.0
	14	40	73.0	1,725	3.5	0.0	-35	+40
Polyamide (1)	21 (control not exposed)	21	45.0	1,200	100	0.0	0.0	0.0
	1	40	(1)	480	200	(1)	-60	+100
Epoxide (1)	21 (control not exposed)	25	4.5	500	180	0.0	0.0	0.0
	1	40	(1)	175	145	(1)	-65	-20

(1) = Value was Indeterminate.

Table 9
Effect of heat-ageing on load-extension properties of detached films

Nature of film	Exposure conditions		Mean mechanical properties			Percentage changes in mechanical properties		
	Time (days)	Temp (°C)	Young's modulus (g/sq. mm $\times 10^3$)	Tensile strength at break (g/sq. mm)	Extension at break (per cent)	Young's modulus	Tensile strength	Extension at break
Polyurethane	21 (control not exposed)	21	3.4	3,100	400	0.0	0.0	0.0
	10	40	2.8	2,450	480	-18	-21	+20
	10	50	4.8	3,125	320	+41	0.0	-20
Butadiene acrylonitrile copolymer	21 (control not exposed)	21	1.1	440	690	0.0	0.0	0.0
	10	40	1.55	780	510	+41	+77	-26
	10	50	1.69	960	500	+54	+18	-28
Polychloroprene	21 (control not exposed)	21	1.5	1,065	430	0.0	0.0	0.0
	10	40	1.2	555	125	-20	-48	-71
	10	50	0.50	140	65	-67	-87	-85
Epoxide (2) Polyamide 1	21 (control not exposed)	21	750	2,640	2.5	0.0	0.0	0.0
	10	40	100	2,685	3.9	+33	+2	+56
	10	50	75	2,145	3.0	0.0	-19	+20

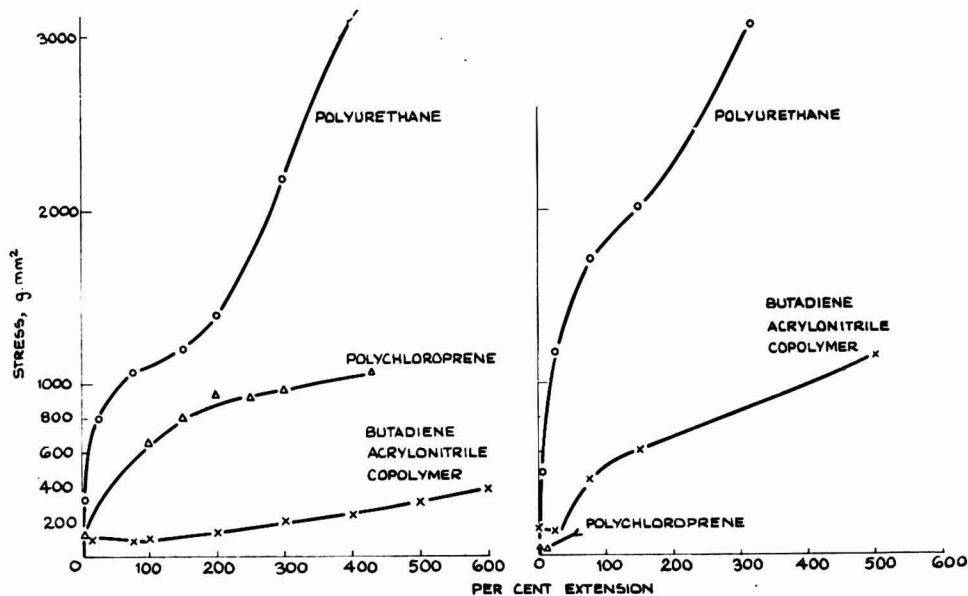


Fig. 2. (Left) Load extension properties of unaged detached films, (right) load extension properties of detached films after ageing ten days at 50°C

Outdoor exposure trials

The mechanical tests described in previous sections would be of even greater value provided they were capable of forecasting surface coating durability after short periods of outdoor exposure. Few comprehensive studies (Talen apart⁶) have been reported on changes of cohesion, and none, as far as the author is aware, in changes of adhesion of modern surface coatings during atmospheric exposure.

Preliminary investigations by the present author and his co-worker Lawson¹⁷ attempted to predict the durability of a selection of pigmented alkyd and oleoresinous surface coatings whose exposure commenced during both Autumn and Spring. The results were encouraging and indicated that, by observing changes in physical properties of the coatings during the exposure periods by load-extension tests, breakdown in their cohesive properties could be predicted after shorter periods of exposure out-of-doors compared with conventional visual assessments.

It appeared that important requirements for satisfactory cohesive behaviour during exposure was the ability of films to yield beyond their elastic limit and retain good flexibility, indicated by retention of extension at break and strain energy (toughness) properties. For example, Figure 3, coatings *D* and *F* which showed the smallest losses of extension at break, judged visually after two years outdoor exposure showed only slight loss of gloss and chalking. On the other

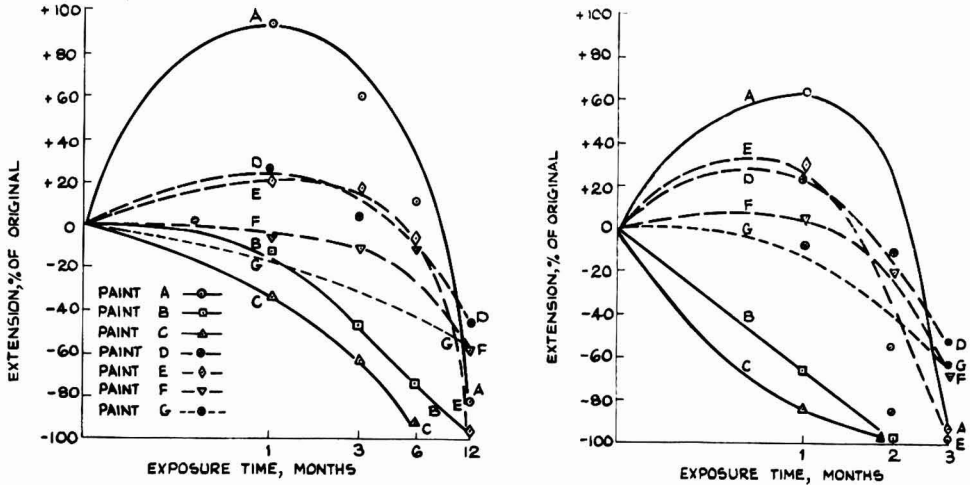


Fig. 3. Paints A to G (Autumn series) showing change in extension at break on outdoor exposure, (right) paints A to G (Spring series) showing extension at break on outdoor exposure

hand coatings *B*, *C* and *E* showing considerable losses of extension at break, eventually failed by checking and cracking. Between these extremes, coating *A* showed severe chalking and erosion, and coating *G* slight corrosion of the metal substrate.

It was also shown that the rates of change of mechanical properties for coatings exposed during Spring was two to four times faster compared to identical coatings commencing exposure during Autumn. Judged visually, cohesive failures of the coatings eventually occurred during the exposure periods at rates similar to those predicted by mechanical tests.

Similar techniques have been used by the author in collaborative work aimed at developing an accelerated weathering cycle capable of simulating natural weathering¹⁸, this included observations of the changes in mechanical properties (using load extension tests on detached films) of coatings during exposure to natural and accelerated weathering.

The results suggested that the reason why current accelerated weathering cycles often produce visual failures of a kind different from natural weathering is because of the inability of accelerated cycles to reproduce the differential stresses occurring in surface coatings associated with heating, cooling, wetting and drying effects.

Although overall changes in mechanical properties of films exposed to current accelerated weathering cycles were ten to 30 times faster compared to natural weathering, the rate of change for specific mechanical properties were often different.

However, one experimental cycle examined produced changes in both mechanical properties and visual breakdown which correlated more closely to natural weathering than any of the cycles in current use. In this cycle the apparatus functioned normally with radiation from a carbon-arc source of illumination and continuous water-spraying. At the end of a ten-hour period, water to the sprays was cut off, and compressed air introduced for a two-hour period. After this period of cooling, the cycle was continuously repeated up to 1000 hours' exposure.

Similarly, the author has attempted to use changes in adhesion characteristics of films during outdoor exposure to forecast their ability to protect metal substrates. Using the direct-tension method, previously described, preliminary results suggested that coatings which eventually failed by peeling or blistering, or whose substrates rapidly corroded, was reflected by reductions of joint-strength and changes of the type of failure observed during the early stages of outdoor exposure. For example, this method was used to examine changes in the adhesion of a clear phenol-formaldehyde lacquer applied to mild steel, and dried at various temperatures before exposure out of doors¹⁹. Unexposed films (controls) dried below 100°C failed in adhesion at joint-strengths of about 800 g/sq. mm. Controls stoved above 100°C failed cohesively at about 2500 g/sq. mm. During two months' outdoor exposure joint-strengths increased by 12-25 per cent, and films dried below 100°C failed cohesively close to the metal substrate. Films stoved above 100°C failed cohesively, in the same way as the controls.

Judged visually after six months' outdoor exposure, mild steel panels coated with lacquer stoved above 100°C showed slight to moderate corrosion, while panels coated with lacquers dried below 100°C usually showed moderate to severe corrosion.

Further exposure trials

The following section describes in some detail, observations of changes in both adhesive and cohesive properties of a selection of surface coatings during exposure out of doors together with visual assessments.

Selection of coatings

Nine pigmented (Coded 1-9) and four unpigmented (Coded 10-13) surface coatings were selected for exposure trials. Brief details of their formulations are recorded in Table 10.

Substrates and application

Visual assessment and adhesion trials

Coatings 1-9 were applied by brushing to clean degreased mild steel panels 15 × 10 cm previously coated with primer (red oxide to DEF 1035), to give a

dried film thickness of 30-40 μ . Coatings 10-13 were applied by brushing to clean degreased mild steel panels 15 \times 10 cm to give a dried film thickness of 15-20 μ .

Load-extension tests

Coatings 1-13 were applied as single coats by spinning to clean 15 \times 10 cm tin foil (10 mil thick) panels to give dried film thicknesses similar to above, the method is described in the Appendix.

Exposure trials

After drying in air at 21°C for ten days the coated panels were exposed at Waltham Abbey during Spring 1962. Panels were mounted on a rack at 45 degrees to the vertical, facing south.

Methods of test

Mechanical tests

Coated panels were removed from exposure at intervals and their mechanical properties determined by load-extension tests using detached films, and direct-tension tests on coated discs removed from mild steel panels. The methods are described in the Appendix.

Visual assessments

The coated panels were examined at intervals during exposure both with normal corrected vision and microscopically ($\times 20$ magnification) and the breakdown of the films assessed under various headings, e.g. loss of gloss, chalking, cracking using the Chemical Inspectorate ratings given below.

Rating :

- 0 = No failure.
- 1 = Very slight failure.
- 2 = Slight failure.
- 3 = Definite failure.
- 4 = Bad failure.

Results and Discussion of outdoor exposure trials

The results recorded in Table 10 indicate that except for coating 9, which was brittle, unexposed coatings were either soft and tough or soft and weak. During outdoor exposure they eventually became brittle as indicated by increases in tensile strength with corresponding reductions of extension at break. This was attributable to cross-linking, molecular scission, and removal of low molecular weight components from the films. The adhesions of the coatings were usually greater than the cohesive strengths of the primers to which they were applied, although losses changes in adhesion characteristics were sometimes suggested, by reductions in joint-strengths and changes in the site or type of failure, as for example, from cohesion to loss of adhesion. Adhesion failures were attributed to stress concentrations within the films ; the formation of corrosion products underneath the primer may also have had significant effects.

The results appeared to confirm those previously obtained¹⁷, that for pigmented coatings, changes in their physical properties could often be detected by

Table 10
Changes in mechanical properties of surface coatings compared with visual assessments after (3-24 months) exposure out of doors

Coating	Main film-forming constituents	Duration of exposure (months)	Cohesive properties (load-extension method)			Adhesive properties (direct tension method)			Visual assessments (degree of breakdown) (CI scale) on mild steel	
			Tensile strength (g/sq. mm)	Ex-tension at break (per cent)	Per cent change of property	Joint strength (g/sq. mm)	Joint strength (per cent) change	Major type of failure (visual)		
				Tensile strength at break	Ex-tension at break					
1	65 per cent oil-length tobacco oil-seed, alkyd, pigmented with lead chromate and prussian blue	Control (not exposed)	700	70	0.0	-0	975	0.0	Cohesion primer	—
		3	650	30	-7	-57	900	-8	Cohesion primer	Nil
		9	1,175	7.5	+68	-89	850	-13	Adhesion finish/primer	Nil
		24	—	—	—	—	—	—	—	gloss (2) checking (1) cracking (1)
2	65 per cent oil-length linseed-oil, alkyd, pigmented with rutile titanium dioxide	Control (not exposed)	850	80	0.0	0.0	1,750	0.0	Cohesion primer	—
		3	1,025	65	+20	-19	775	-56	Cohesion primer	chalking (1)
		9	1,575	5	+85	-94	1,075	-39	cohesion primer and adhesion primer/metal	chalking (1)
		24	—	—	—	—	—	—	—	chalking (1) blisters (1)
3	65 per cent oil-length linseed-oil, vinyl toluene, alkyd, pigmented with rutile titanium dioxide	Control (not exposed)	700	50	0.0	0.0	1,675	0.0	cohesion primer	—
		3	735	25	+5	-50	1,300	-23	cohesion primer	gloss (1) chalking (1)
		9	950	5	+36	-90	1,400	-17	cohesion primer	gloss (2) chalking(1)
		24	—	—	—	—	—	—	—	gloss (4) chalking (3)
4	50 per cent oil-length linseed-oil, epoxide-ester, resin pigmented with rutile titanium dioxide	Control (not exposed)	1,175	20	0.0	0.0	1,125	0.0	cohesion primer	—
		3	1,225	12	+4	-40	950	-16	adhesion finish/primer	gloss (1) chalking (1)
		9	1,900	3	+62	-85	1,400	+4	adhesion finish/primer	gloss (3) chalking (2)
		24	—	—	—	—	—	—	—	gloss (4) chalking (4)

Table 10 (continued)

Coating	Main film-forming constituents	Duration of exposure (months)	Cohesive properties (load-extension method)				Adhesive properties (direct tension method)				Visual assessments (degree of breakdown) (CI scale) on mild steel
			Tensile strength (g/sq. mm)	Ex-tension at break (per cent)	Per cent change of property		Joint strength (g/sq. mm)	Joint strength change (per cent)	Major type of failure (visual)		
				Ex-tension at break	Tensile strength	Ex-tension at break					
5	65 per cent oil-length tobacco oil-seed alkyl, pigmented with rutile titanium dioxide and zinc oxide (9:1)	Control (not exposed)	470	48	0.0	0.0	950	0.0	cohesion primer	—	
		3	860	42	-82	-13	1,125	+18	cohesion primer	gloss (1)	
		9	1,350	30	+187	-37	1,500	+57	cohesion primer	gloss (1)	
		24	—	—	—	—	—	—	—	gloss (1) chalking (2)	
6	Oleoresinous (linseed-tung oil) pigmented with lead chromate and pigment dyestuff	Control (not exposed)	50	52	0.0	0.0	925	0.0	cohesion primer	—	
		3	190	4	+280	-77	975	+5	cohesion primer	gloss (1)	
		9	100	0.5	+100	-96	950	+2.5	adhesion finish/primer	gloss (1) checking (1)	
		24	—	—	—	—	—	—	—	gloss (4) checking (4)	
7	60 per cent oil-length linseed-oil alkyl, pigmented with iron oxide	Control (not exposed)	300	74	0.0	0.0	1,050	0.0	cohesion primer	—	
		3	680	60	+127	-19	1,200	+11	cohesion primer	gloss (1)	
		9	1,250	25	+317	-66	1,100	+5	cohesion primer	gloss (1)	
		24	—	—	—	—	—	—	—	gloss (2) chalking (1)	
8	Oleoresinous (linseed-tung oil) pigmented with lead chromate and prussian blue	Control (not exposed)	210	51	0.0	0.0	1,500	0.0	adhesion primer/finish	—	
		3	280	0.5	-33	-98	1,055	-30	finish cohesion	gloss (1)	
		9	—	—	—	—	600	-60	finish cohesion	gloss (4)	
		24	—	—	—	—	—	—	—	checking (3) cracking (3)	
9	Epoxide resin. Polyamide resin blend (1:1), pigmented with rutile titanium dioxide	Control (not exposed)	1,900	2.5	0.0	0.0	2,650	0.0	glue/finish	—	
		3	900	2.0	-53	-20	1,425	-46	adhesion primer metal	chalking (1) gloss (2)	
		9	400	0.5	-78	-80	1,575	-40	adhesion primer metal	gloss (3) chalking (3)	
		24	—	—	—	—	—	—	—	chalking (4) checking (1)	

Table 10 (continued)

Coating	Main film-forming constituents	Duration of exposure (months)	Cohesive properties (load-extension method)			Adhesive properties (direct tension method)				Visual assessments (degree of breakdown) (CI scale) on mild steel
			Tensile strength (g/sq. mm)	Ex-tension at break (per cent)	Per cent change of property	Joint strength (g/sq. mm)	Joint strength (per cent) change	Major type of failure (visual)		
					Tensile strength	Ex-tension at break				
10	50 per cent oil-length linseed-oil, glycerol-phthalate alkyl	Control (not exposed)	1,125	110	0.0	0.0	2,000	0.0	cohesion finish	—
		3	1,350	5.5	+20	-95	1,200	-40	cohesion finish	corrosion (2)
		9	—	—	—	—	—	—	—	corrosion (3)
		12	—	—	—	—	—	—	—	corrosion (4)
11	45 per cent oil-length dehydrated castor-oil, epoxide resin ester	Control (not exposed)	1,225	95	0.0	0.0	2,100	0.0	Cohesion finish	—
		3	1,600	9.5	+30	-90	1,050	-50	Cohesion finish	corrosion (2)
		9	—	—	—	—	—	—	—	corrosion (4)
		12	—	—	—	—	—	—	—	corrosion (4)
12	50 per cent oil-length tung-oil, p'phenyl phenol formaldehyde	Control (not exposed)	1,400	25	0.0	0.0	1,600	—	adhesion metal finish	—
		3	2,450	2.5	+75	-90	1,500	-6	adhesion metal finish	corrosion (1)
		9	—	—	—	—	—	—	—	corrosion (2)
		12	—	—	—	—	—	—	—	corrosion (3)
13	Epoxide polyamide resin (1:2)	Control (not exposed)	1,200	100	0.0	0.0	2,450	—	cohesion finish	—
		3	2,575	25	+115	-75	1,450	-40	cohesion finish	corrosion (2)
		9	—	—	—	—	—	—	—	corrosion (2)
		12	—	—	—	—	—	—	—	corrosion (3)

Key : — no tests (CI Scale 0 = No breakdown; 4 = Severe breakdown)

mechanical tests after shorter periods of outdoor exposure than by visual assessments. For example, the most satisfactory pigmented coatings judged visually after 2 years' outdoor exposure were 5 and 7 (based on oil-modified alkyd media) which apart from slight chalking and loss of gloss were in very good condition. Judged by mechanical tests on their detached films during the first nine months of exposure they became progressively tougher as indicated by increases in tensile strength with relatively small decreases in extension at break. Their adhesions judged by retentions of joint-strength also remained satisfactory during the first nine months of exposure. On the other hand, the coatings with the poorest cohesive properties judged visually between nine and 24 months' outdoor exposure were 6 and 8 (based on oleoresinous media, pigmented with lead chromate) which failed by severe checking, cracking and crazing. Judged by mechanical tests on their detached films after three months' outdoor exposure they became extremely brittle as indicated by considerable reductions in extension at break with only small changes in tensile strength. Judged by retentions of joint strength in direct-tension the adhesion of coating 6 was satisfactory while that of coating 8 was rather poor.

After two years' outdoor exposure, coating 9 (an epoxide/polyamide resin 1:1, pigmented with rutile titanium dioxide) showed severe chalking and slight checking. Judged by mechanical tests on detached films during three to nine months' exposure considerable weakening of this coating was indicated by reductions of tensile strength and extensions at break (which was low initially). Changes of adhesion were also significant, unexposed films failed cohesively at joint-strengths above 2,500 g/sq.mm, after nine months' exposure adhesive failures between primer and metal at joint strengths of 1,500 g/sq.mm were recorded.

During nine months' outdoor exposure, coatings 1-4 became very brittle as shown by considerable reductions of extension at break and increases in tensile strength although no serious breakdown was observed at this stage. Changes in their adhesion characteristics may, however, have been significant, for example coating 1 (an oil modified alkyd, pigmented with lead chromate) showing small reductions in joint-strength but failing by loss of adhesion to the primer, broke down after 2 years out of doors by slight cracking. Coating 2 (an oil modified alkyd, pigmented with rutile titanium dioxide) showing 50 per cent reductions in joint-strength, failed by slight blistering after the same period. Coating 4 (an epoxide resin ester pigmented with rutile titanium dioxide) failing adhesively between primer and finish at increased joint-strengths, eventually failed out of doors by severe chalking and loss of gloss. Coating 3 (a vinyl toluene alkyd, pigmented with rutile titanium dioxide) failing cohesively with small reductions of joint-strength broke down after 2 years by severe chalking and moderate loss of gloss.

The most significant changes in mechanical properties of surface coatings appeared to occur between one and six months outdoors; Fig. 4 indicates changes in load-extension properties of films of Coating 5 (a good paint) and 8 (a poor paint) up to six months' exposure. Similarly, overall changes in cohesive and adhesive properties of Coatings 5 (a good paint) and 9 (a poor paint) are indicated in Fig. 5.

Correlations between changes in mechanical properties and visual appearance of unpigmented Coatings 10-13 were not quite so decisive as those obtained for pigmented coatings. Certain trends were, however, suggested, unexposed coatings 10, 11 and 13 were soft and tough, while Coating 12 was less flexible. During three months' outdoor exposure Coatings 10-12 became brittle while coating 13, as indicated by moderate retention of extension at break, was moderately ductile. Coatings 10 (a linseed oil-modified alkyd) and 11 (a dehydrated castor-oil, epoxide resin ester) showed 90 to 95 per cent reductions in extension at break and 40 to 50 per cent reductions of joint-strength. Judged visually after three months' exposure out of doors, mild steel panels coated with these materials showed slight corrosion, while after nine months' exposure severe corrosion was observed. Judged by mechanical tests coatings 13 (an epoxide/polyamide resin 1:1) showing the smallest reductions in extension at break and 12 (a tung oil, phenolic) the smallest reductions of joint strength (although failures were adhesive to metal) gave the best protection against corrosion judged visually after nine months' exposure.

The results, particularly those obtained for Coatings 10 and 11, confirm that good mechanical properties of unexposed coatings do not necessarily guarantee good durability during outdoor exposure. The results of mechanical tests on Coatings 1-13 suggest that good durability depends not only on the ability of a film to maintain satisfactory cohesion indicated by flexibility and shown by retention of good extension at break properties, but also on satisfactory adhesion shown by retention of joint strength and the type of failure observed. Failure should preferably be cohesive indicating that adhesive strength exceeds cohesive strength ; however, where apparent adhesive failures occur, a high joint-strength appears to be essential. Loss of adhesion (peeling, flaking) in practice is usually more serious than cohesive failures (chalking, checking), and leads to rapid deterioration of metal surfaces : On the other hand, coatings failing cohesively may continue to protect the underlying substrate and recoating is also less difficult. With pigmented coatings it may be that cohesive failures are due to the same causes as apparent adhesive failures to substrates. This may be explained by the fact that paint films contain polymeric media reinforced with pigment

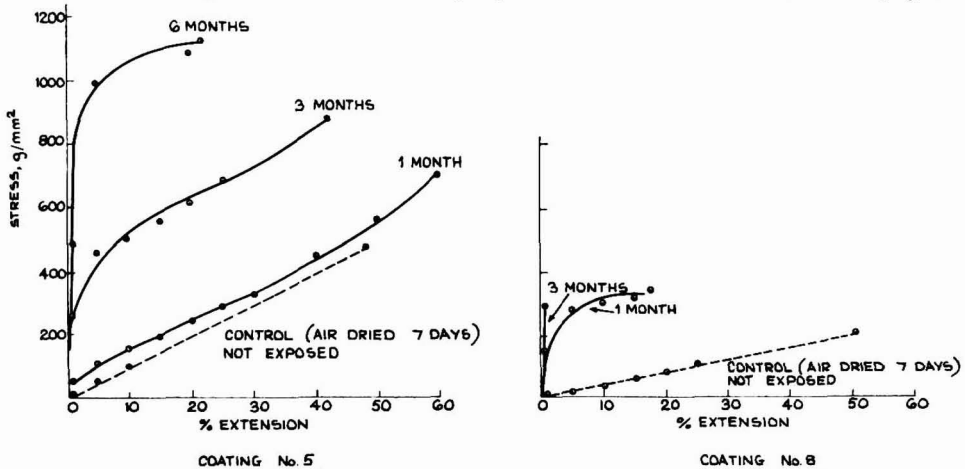


Fig. 4. Load extension properties of coatings during outdoor exposure

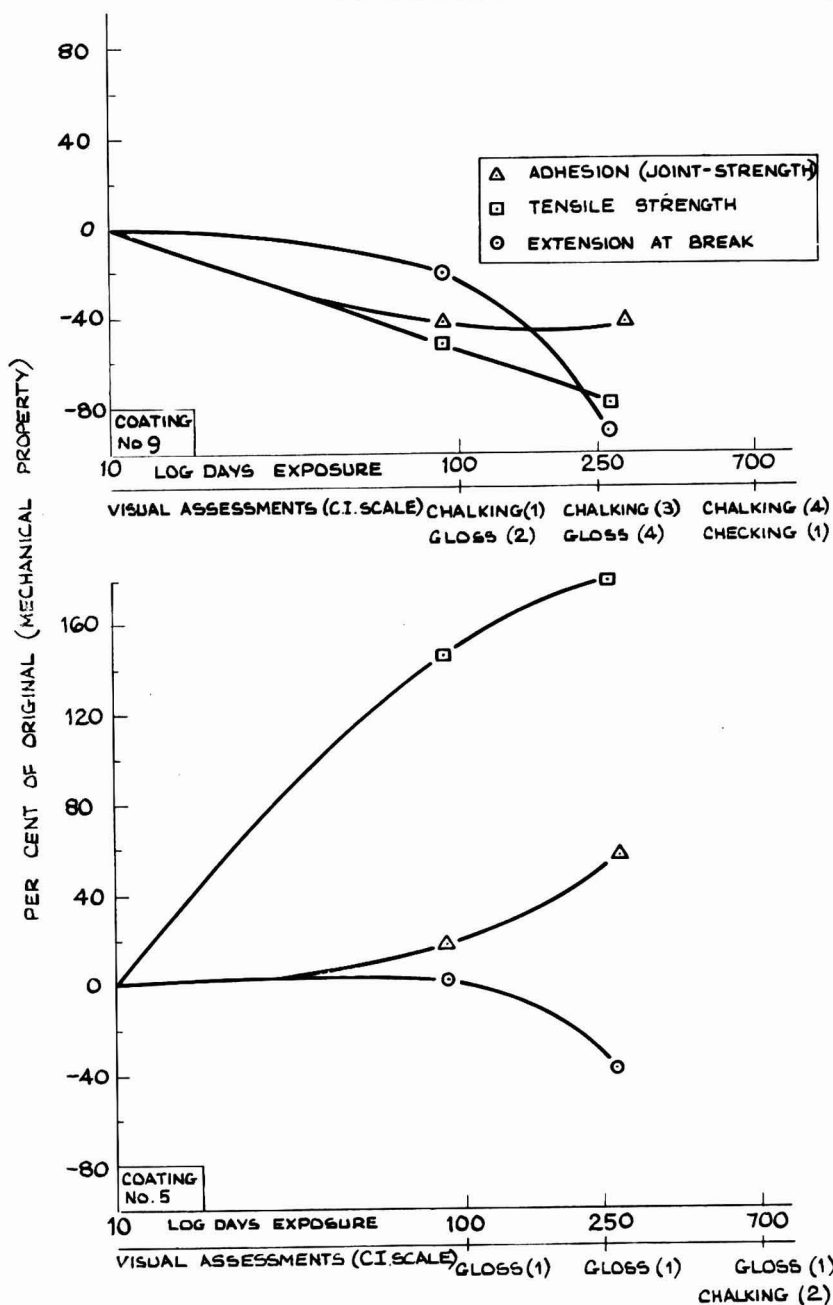


Fig. 5. Curves showing changes in properties of surface coatings during two years' outdoor exposure

particles and consist of a large number of microscopically bonded structures. Thus the cohesive strength of a film depends on the bond strength achieved between polymer and pigment, and pigments should be considered in the same way as substrates²⁰.

Although when many of the coatings were examined visually they did not appear to be failing through loss of adhesion, it must be appreciated that the stresses imposed during the exposure trials due to the United Kingdom climatic conditions were of relatively small magnitude. In a more aggressive climate, or in the event of other stresses being imposed simultaneously, for example, abrasion or continuous flexing, their eventual failure in this way is a distinct possibility.

Improved methods of assessment

One objection to the method described for examining the adhesion of surface coatings was that the epoxide resin-based adhesive used for bonding the coating to the testpiece required up to seven days at room temperature to develop sufficient strength to remove many coatings; and during this period changes in adhesion of the film to the substrate may also have occurred. However, recent investigations show that adhesion of many coatings may be determined within one hour of removal from exposure using a rapid setting cyano-acrylate adhesive (*Eastman-Kodak 910*). In this way the effects of various periods of conditioning indoors on the adhesions of three unpigmented coatings applied to brass and mild steel panels were determined after 168 hours' immersion in distilled water.

The results recorded in Table 11 show that after six hours' recovery at room temperature all the coatings failed adhesively, films of tung-oil phenolic gave

Table 11
Mechanical properties of coatings after 168 hours' immersion in distilled water

Surface coating	Time of conditioning at 20°C after immersion (hours)	Adhesion (direct-tension method) on					
		Brass			Mild steel		
		Joint-strength (g/sq. mm)	Change in joint-strength (per cent)	Major type of failure	Joint-strength (g/sq. mm)	Change in joint strength (%)	Major type of failure
50 per cent oil-length tung-oil phenolic	Control (not exposed)	700	0	(ad.)	1600	0	(ad.)
	6	140	-80	(ad.)	160	-90	(ad.)
	168	700	0	(ad.)	1340	-16	(ad.)
50 per cent oil-length linseed-oil alkyd	Control (not exposed)	1650	0	(co)	2000	0	(co)
	6	0	-100	(ad)	20	-99	(ad.)
	168	1300	-21	(co)	1900	-5	(co)
45 per cent oil-length dehydrated castor-oil epoxide ester	Control (not exposed)	1050	0	(ad.)	2100	0	(co)
	6	20	-98	(ad.)	105	-95	(ad.)
	168	950	-10	(ad.)	1700	-20	(co)

ad = adhesive failure.

co = cohesive failure

the smallest reductions in joint strength (80 per cent on brass and 90 per cent on mild steel) compared with 100 per cent reductions for alkyd and epoxide resin-ester films. After 168 hours at room temperature considerable improvements in joint strengths of all the coatings were recorded, being 100 per cent for tung-oil phenolic and 75-95 per cent for alkyd and epoxide resin ester films. It was concluded that though the tung-oil-phenolic coating failed adhesively, the retentions of joint-strength after water immersion and rapid recovery afterwards suggested its superiority over the other two coatings selected for comparison.

Similarly, the problem of assessing the cohesive properties of exposed coatings within short periods of removal from exposure was overcome. Films were detached from their substrates in the usual way and mounted on an exposure rack protected from direct attack from wind and rain by suitable screens and covers. The films were re-exposed out of doors and withdrawn as required; their load-extension properties were determined after specified intervals of conditioning indoors at room temperature.

Table 12 records the changes in the mechanical properties of three unpigmented coatings applied to mild steel and exposed out of doors for two months. The

Table 12

Mechanical properties of coatings after 2 months' outdoor exposure and visual assessments after 12 months

Surface coating	Time of conditioning at 21°C after exposure (hours)	Adhesion			Extension at break		Visual assessment Degree of corrosion (C.I. Scale) 12 months
		Joint-strength (g./sq. mm)	Change of joint-strength (%)	Major type of failure	(%)	Change (%)	
60 per cent oil-length linseed oil alkyd. A.D.	Control (not exposed)	2200	0	(co)	120	0	(4) severe
	1	110	-95	(ad.)	144	+20	
	25	880	-60	(co)	98	-19	
	150	1430	-35	(co)	25	-80	
50 per cent oil-length tung-oil phenolic. A.D.	Control (not exposed)	1600	0	(ad.)	25	0	(2) slight
	1	800	-50	(ad.)	15	-40	
	25	1520	-5	(ad.)	14	-44	
	150	1550	-3	(ad.)	5	-80	
Epoxide resin Phenolic resin 9 : 3 condensate (S.)	Control (not exposed)	2500	0	(co)	7.5	0	(2) slight
	1	2100	-16	(co)	7.5	0	
	25	2550	+2	(co)	6.75	-10	
	150	2450	-2	(co)	3.0	-60	

A.D. = dried in air 7 days S. = stoved $\frac{1}{2}$ (h) at 175°C

coatings were removed from exposure following continuous rain and conditioned at room temperature for 1-150 hours. Visual assessments of the panels after 12 months' exposure are also recorded.

The results show that considerable changes in mechanical properties occurred during relatively short periods of conditioning at room temperature. Retention of adhesive strength appeared to be an important factor in respect to the ability of coatings to protect mild steel from corrosion.

Temperature and rate of testing

While the value of comparative results obtained at room temperature and standardised rates of test cannot be doubted, it might be misleading to use such data in developing coatings for supersonic aircraft or missiles for example, because of the extremes in temperature and high speeds likely to be encountered in service.

Table 13 summarises preliminary results indicating the effect of different strain rates on the load-extension properties of a number of clear and pigmented films which appear to confirm the trends previously suggested in Fig. 7, namely : With increased strain rates yield strength increased, extension at break was variable, extension at yield was generally unaffected while tensile-strength at break increased.

Similar changes are suggested in Fig. 6 where load-extension curves for a linseed-oil alkyd examined within a limited range of temperature and strain rates are shown. The curves show that reductions in temperature were similar to increased strain rates.

Determining load-extension properties at very high strain rates calls for complex apparatus, therefore the prediction of certain mechanical properties at high rates by a superposition method from data obtained at low temperatures and moderate rates would be useful. A relationship is expressed by the Williams-Landel-Ferry (WLF) constant ²¹.

$$\log a = \frac{8.86 (T-T_g)}{101.6 (T-T_g)}$$

where a = WLF superposition constant

T = absolute test temperature

T_g = absolute glass transition temperature + 50°C.

Beuche²² has shown the WLF equation has a molecular basis and would be applicable to ultimate properties, eg. tensile strength and extension at break. It is considered that future investigations in this field including adhesion studies would prove particularly fruitful in respect to the development of improved surface coatings.

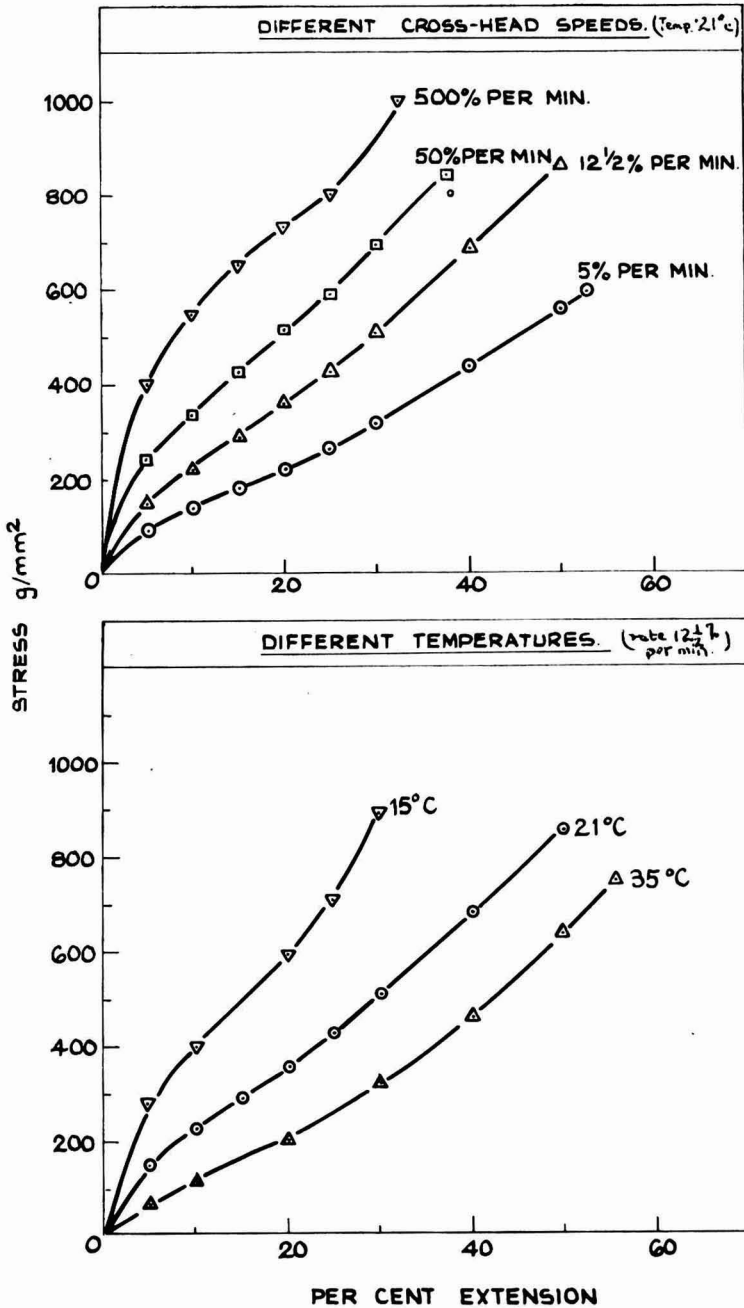


Fig. 6. Load extension curves showing the effect of varying rates and temperature of testing (films of oil modified alkyd after 14 days at atmospheric pressure)

Table 13
Effect of rate of testing on load-extension properties of coatings

Film	Rate (per cent) at 21°C	Load extension properties			
		at yield		at break	
		strength (g/sq. mm.)	extension (%)	strength (g/sq. mm.)	extension (%)
Cellulose acetate	12.5	5,000	3.5	5,250	40
	125	6,100	3.5	5,650	35
Polystyrene	12.5	I.D.	I.D.	9,500	3.5
	125	I.D.	I.D.	11,750	3.0
Chlorinated rubber based paint	12.5	N.D.	N.D.	290	100
	125	N.D.	N.D.	550	90
	1225	N.D.	N.D.	890	200
60% oil length linseed oil alkyd	12.5	N.D.	N.D.	136	58
	125	N.D.	N.D.	325	100
	1225	N.D.	N.D.	690	135
Alkyd based paint	1.25	N.D.	N.D.	120	30
	12.5	N.D.	N.D.	290	43
	125	N.D.	N.D.	450	60

ND = value not determined ID = value was determined

Value of mechanical tests

Mechanical tests are useful ways of examining physical properties of surface coatings. Load-extension tests on detached films provide a suitable method for assessing cohesive properties, and direct-tension tests are valuable for assessing adhesion (or cohesion if this is less) of coatings attached to substrates.

Some advantages of the methods described, include their ability to :

- (1) Determine quantitatively certain fundamental physical properties of coatings.
- (2) Screen potential film-forming materials and reject those with unsuitable features thereby avoiding protracted laboratory and exposure trials.
- (3) Observe changes in physical properties of coatings during exposure trials and give useful forecasts of their durability.
- (4) Check doubtful results obtained by tests of an arbitrary or empirical nature.
- (5) Assist with typical development problems including formulations, selection of substrates and treatments thereon.

Disadvantages of the methods include :

- (1) A certain degree of skill and close control of experimental conditions are essential to obtain results which are reproducible ; in addition, they are rather time consuming.
- (2) The effect of stripping films off substrates may have certain adverse effects on their load-extension properties.

- (3) Unrealistic adhesion characteristics might be produced in certain coatings due to stresses produced when bonding them between test-pieces ; similarly, a further possibility is inter-action between adhesive and coating.

Conclusions

Mechanical tests are described which enable adhesive and cohesive properties of surface coatings to be determined quantitatively ; such methods are preferred to conventional testing methods and appear to be of considerable value in examining potential film-forming materials, variations in formulation and surface treatments. It may now be possible to accelerate the development of surface coatings by a more rigorous examination of their behaviour during exposure than has been customary hitherto. The tests show some promise in predicting surface coating durability after periods of exposure shorter than for visual assessments. When sufficient data is available to specify threshold values for selected physical properties, it might be possible to formulate coatings resistant to selected environments from specific parameters of mechanical behaviour.

Important requirements for surface coating durability include satisfactory cohesion as shown by the ability of a film to maintain a high degree of ductility, and by good extension at break and toughness properties. Cohesive failures are more likely in films which embrittle rapidly as shown by low extensions at break and poor toughness. Satisfactory adhesion, is also essential and is indicated by the ability of a film to maintain a high joint-strength, failing preferably by loss of cohesion. Other important requirements include the ability of films to recover rapidly from the effects of stresses applied over a wide time and temperature scale.

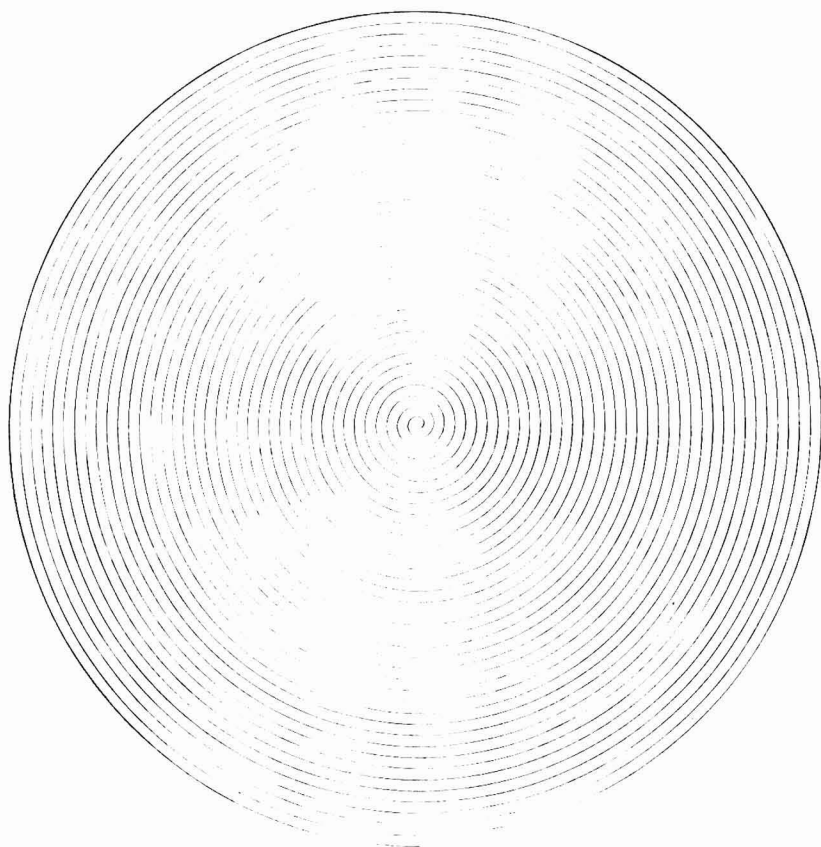
Acknowledgments

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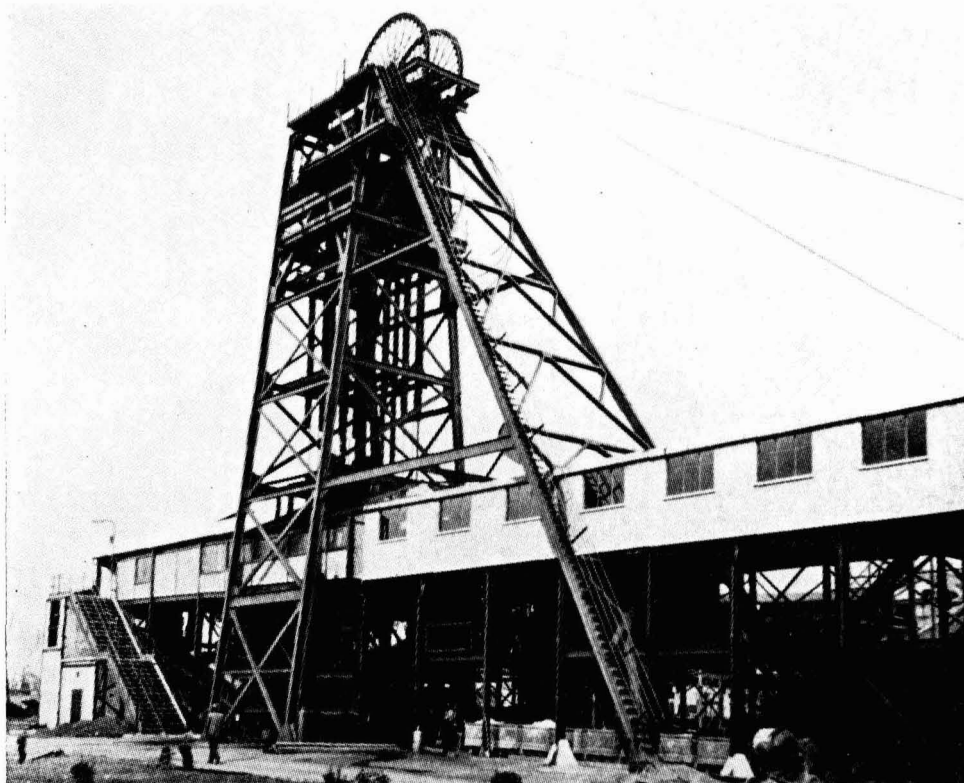


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Appendix

Methods of test

The methods of test used for preliminary examination of surface coatings and for subsequent development and exposure trials were as follows :

Load-extension properties

Preparation of detached films

Films were prepared on high-grade pure tin foil panels 0.5 mm thick. Flaw-free films were obtained with uniform film thickness (with exception of a small depression in the centre of the panel which is not used) by spinning, usually for one minute at between 350 and 800 rpm depending on the viscosity and solids content of the surface coating. The coatings were strained through a fine mesh nylon cloth and 10ml poured in the centre of a tin panel 15×10 cm attached to the table of the machine. Films of polychloroprene, polyvinyl chloride and solvent free epoxide polyamide resins were prepared by casting using a doctor blade.

Coated tin panels were removed from outdoor-exposure or heat ageing trials at required intervals. Specimens were prepared by scribing the coated panels with a surgical scalpel using a steel template 10×1 cm ± 0.01 mm to produce 6-9 strips (10×1 cm per panel) with a test area of 6×1 cm as shown in Fig. 7 (shorter strips i.e. 2×1 cm were used when films produced extensions exceeding 100 per cent). Films were removed from the tin by placing the panels coating side up, on clean mercury for one to six hours, after which the films were held with tweezers and any mercury removed with a soft brush. Specimen widths were measured with a horizontal microscope to ± 0.01 mm, and thicknesses determined either with a sensitive dial micrometer or with an air gauge to ± 0.00050 mm.

Load-extension tests

All tests were made with a Baldwin tensile testing machine. A photograph of the apparatus with an air-cell attachment is reproduced in Fig. 8. Detached films were held between neoprene-lined film grips, placed 6 cm apart and the relationship between load and extension autographically traced on to graph paper ; (it should be noted that extension recorded is actual movement of the cross-heads, and not always the true extension of the film).

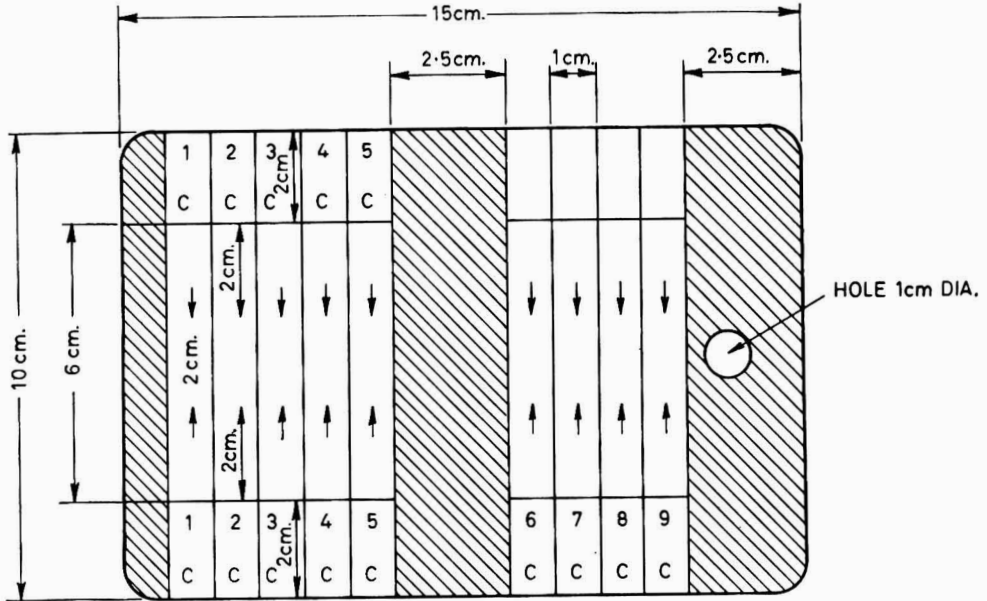


Fig. 7.

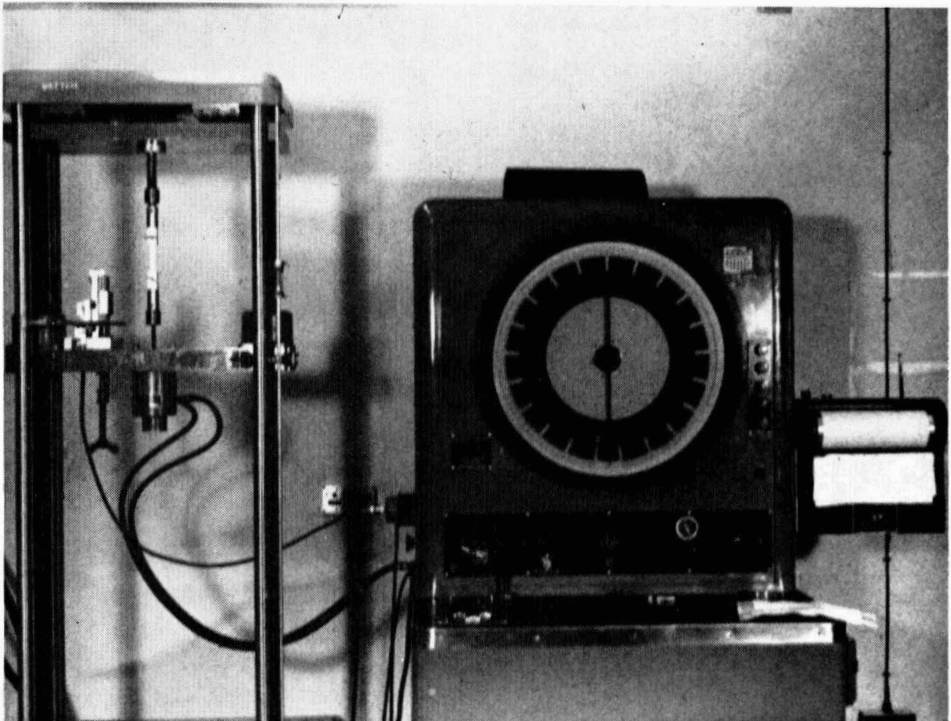


Fig. 8. The apparatus used in the experiments

Usually six flaw-free films from each surface coating per test were examined; all determinations being made at 21°C, 65 per cent RH. Films were extended at a constant cross-head speed of 12½ per cent per minute, unless otherwise stated.

Mean values for Young's modulus, yield and ultimate properties (i.e. extension at break and tensile strength) were calculated on the initial cross-sectional area of the films; their toughness, i.e. maximum strain energy to break, was determined by measuring the areas under the load-extension curves with a precision disc planimeter; their Young's moduli determined from the initial Hookean portion of the load-extension curve at zero extension, and calculated as the stress required to produce 100 per cent linear extension. The reproducibility of the tests using films of an epoxide-ester are indicated in Table 14.

Table 14

Measured mechanical property	Mean (6 replicates)	percentage coefficient of variation
Young's Modulus	350×10^3 g/sq. mm	4.5
Yield stress	675 g/sq. mm	2.5
Yield strain	5.5 per cent	6.5
Tensile strength at break	1225 g/sq. mm	8.0
Extension at break	95 per cent	11.5
Strain energy (toughness)	80 gmm/sq. mm $\times 10^3$	9.2

The significance of load-extension curves and their interpretation is briefly as follows :

Load-extension curves of polymers contain much valuable information on their behaviour in practice. The generalised curve (Fig. 9) is representative of many polymer materials. Similar curves for surface coatings yield important information²³ provided that :

- (i) the curve is obtained by a constant rate of straining test,
- (ii) the point of rupture occurs at any point of the typical curve.

The slope of the initial straight-line (Hookean) portion of the curve, where stress and strain are roughly proportional, is a measure of the stiffness and rigidity of the material. This characteristic is probably due to the resistance of the molecular chains of the materials to uncoiling.

The ratio of stress to strain in this portion is known as the modulus of elasticity or Young's modulus. There follows a region from this point to *A* where stress is no longer proportional to strain. The stress at the first knee of the curve is known as yield stress or limit of proportionality.

Here rupture of cross-links is believed to occur; the stress is a measure of the strength of the material and its ability to resist permanent deformation. The portion of the curve before yield stress is largely recoverable and is a measure of elastic deformation.

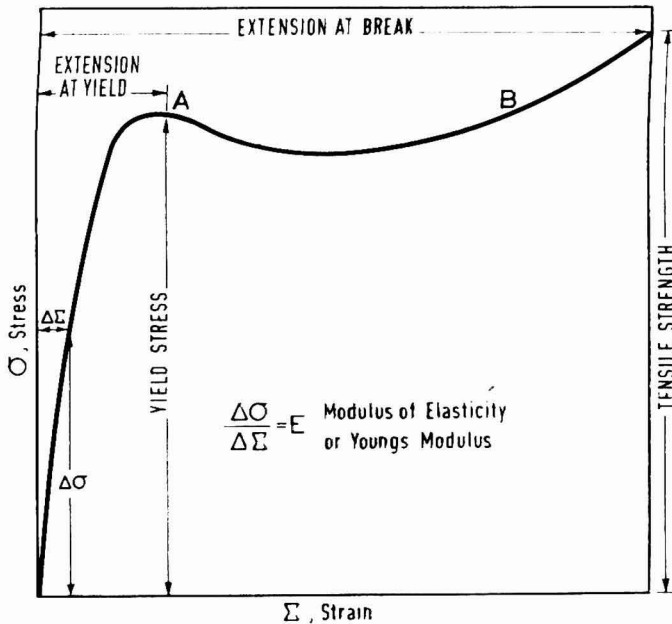


Fig. 9

The extension in the region *A-B* occurs with little or no increase in tensile strength. This is a plastic non-recoverable deformation (cold-drawing) and is believed to be due to molecules slipping and gliding over one another.

The region *B* to the breaking point is also non-recoverable and work or strain hardening occurs. It is supposed that within this region molecules stiffen as a result of stretching and become increasingly difficult to deform. The area under the load-extension curve represents the energy required to rupture the film and is a measure of its toughness.

Adhesion tests in direct-tension

The method of test was essentially as described in *JOCCA*, 1963, 46, 276.

For most trials, cylindrical mild steel test-pieces 2.54 cm in diameter, with their planar faces machined to a CLA value of 10-16 microinches and degreased with hot pure toluene, were used.

For exposure trials, however, the so-called "sandwich" technique (13) was used, the test panels were degreased, abraded, 18 BG mild steel, or brass.

All coatings were applied by brushing giving dry film-thicknesses within the range 15-30 microns.

Coatings were allowed to dry in a horizontal position at 21°C, 65 per cent RH for seven days, film thicknesses were checked by applying coatings under similar conditions to tinfoil panels, the films were separated by amalgamation with mercury and measured with a sensitive dial micrometer.

Coated panels were exposed as required and withdrawn at intervals. Discs 3.17 cm in diameter (six per panel) were punched out with a fly-press. Films were lightly abraded with 0 grade emery paper prior to bonding with adhesive. The adhesive was usually a solvent-free epoxide resin cross-linked either with an equal proportion of polyamide resin or 10 per cent amine.

The adhesive was applied to the surface of the test specimens using a spatula and bonded co-axially to the uncoated test specimen (using cylindrical test-pieces), or the untreated face of the disc was also bonded to an untreated cylindrical test specimen (using the sandwich method), in a jig using a pressure of 700 g/sq. mm applied by a spring. After conditioning a further seven days at 21°C, 65 per cent RH the bonded assemblies (six replicates per test) were pulled apart in a Baldwin tensile testing machine at a constant cross-head speed of 0.75 cm per minute.

An indication of the reproducibility of the test is that where apparent adhesion failures occurred the coefficient of variation was usually between 5 and 15 per cent, where failures were cohesive within the films, the coefficient of variation was between 2 and 10 per cent.

Annual Reports—1964

Report of the Council

ADOPTED AT THE THIRD ANNUAL GENERAL MEETING OF THE INCORPORATED ASSOCIATION HELD AT THE PALACE HOTEL, TORQUAY, DEVON, ON 28 MAY 1965

General

At the end of the second year of the incorporated Association, a very small number of forms of transfer of membership from the unincorporated Association were still outstanding and it was necessary for Council, at its meeting in November, to extend the period during which these could be returned—under Article 5(B)—to 31 December, 1965. Further reminders were then sent to the members concerned and any member who has still not signed and returned the form is requested to do so without delay.

In the February issue of the *Journal* sent to all members in the United Kingdom, Council was glad to be able to include details of the formation of a group of the British United Provident Association in order to help members who, in the event of illness, would like to be able to have private treatment for themselves and their families. Group membership enables a rebate in the BUPA subscription rates and details of the rebate to be enjoyed by members of the Association with effect from 1 March 1965 were set out in the September issue of the *Journal*.

The Sixteenth Technical Exhibition took place from 16-19 March and a report appears later under the Exhibition Committee Report. A detailed review of the Exhibition appeared in the May issue of the *Journal*.

On 1 March, Dr. K. E. Lewis was appointed as the Association's Research Fellow. Work on the project "The Relation Between Adsorption on Pigment Surfaces and Stability of Dispersion, with particular emphasis on Flotation and Related Phenomena" commenced at Nottingham University, under the supervision of Dr. G. D. Parfitt. For the purpose of collaborating and discussing the progress of the project with Dr. Parfitt and Dr. Lewis, the Council at its February meeting set up a Technical Committee; a report of the Committee's visit to Nottingham University in December is included later under the Report of that Committee.

The Biennial Dinner and Dance of the Association was held at the Savoy Hotel, London, on 10 April and although this was the latest date on which this function had been held at the Savoy Hotel the previous attendance figure of 400 members and guests was maintained. The Toast to the Association was proposed by Professor H. J. Emeleus, C.B.E., F.R.S. (President of the Royal Institute of Chemistry), and other guests whom the members had the opportunity of welcoming on this occasion were Mr. G. H. Carnall (President of the Society of Dyers and Colourists), Mr. A. P. Low (President of the Paintmakers Association), Mr. C. E. Tinsley (President of the Society of British Printing Ink Manufacturers) and Mr. E. L. Giles (Master of the Worshipful Company of Painter Stainers). A full report and photographs of the Dinner and Dance were published in the June issue of the *Journal*.

In May, the President, accompanied by Mrs. J. E. Arnold, represented the Association at the Seventh Congress of the Fédération d'Associations de Techniciens des Industries des Peintures, Vernis, Emaux et Encres d'Imprimerie de l'Europe Continentale at Vichy and during the banquet Dr. Arnold addressed the company in French. A total of 59 papers was given; the paper presented on behalf of the Association by Dr. S. H. Bell was entitled "Pigment/Medium Relationships." A report of the Congress, with photographs, appeared in the August issue of the *Journal*.

The second Annual General Meeting of the Incorporated Association took place on 17 June in the Court Room at Painter Stainers Hall, London, when on behalf of the Council, the President conferred Honorary Membership of the Association upon Mr. G. A. Campbell (President 1934-36) and presented him with the Scroll of Honorary Membership.

Dr. S. H. Bell was elected President-Designate and the following Vice-Presidents were elected :—

Mr. A. Aitkenhead
 Mr. C. Allsop
 Dr. S. H. Bell
 Mr. A. W. Blenkinsop
 Mr. F. Evans
 Mr. A. S. Fraser
 Mr. W. E. Wornum (Past President)

The Honorary Officers were elected as follows :—

Honorary Secretary	.. .. .	..	Mr. I. C. R. Bews
Honorary Treasurer	.. .. .	..	Mr. F. Sowerbutts
Honorary Editor	.. .. .	..	Mr. D. S. Newton
Honorary Research and Development Officer		..	Mr. A. T. S. Rudram

The report of the auditors on their scrutiny of the postal votes was received and it was announced that the following members had been elected to the Council for the years 1964-66 :—

Dr. T. A. Banfield
 Dr. F. M. Smith
 Mr. R. N. Wheeler

The Annual General Meeting was followed by the Foundation Lecture (instituted in memory of the late Mr. H. A. Carwood, first Honorary Secretary and Honorary Member of the Association) which was given on this occasion by Dr. Raymond R. Myers (Research Director of the Paint Research Institute and Research Professor of Chemistry at Lehigh University) originally under the title "Interdisciplinary Research in Coatings" but amended by the lecturer to "Three Stages and a Quartessence." Council was glad to welcome on this occasion three Founder Members, one of whom (Mr. R. P. L. Britton) proposed the vote of thanks to Dr. Myers.

After the Lecture and following a short reception, Dinner was served in the Dining Room when the President gave an address of welcome, to which the Master of the Worshipful Company of Painter Stainers (Mr. E. L. Giles) replied. The proceedings of the Annual General Meeting and a report, with photographs, of the Foundation Lecture, appeared in the August issue of the *Journal*.

At the July meeting, Council approved the registration of a special design for an Association tie and full details thereof have been published in subsequent issues of the *Journal*. The ties, which have been well received by the membership, can be obtained by members only direct from Thresher and Glenny Limited.

The Sixth Australian Convention, held under the auspices of the Australian Federal Committee, was held at Warburton from 16-19 July and, despite a blizzard and a record snowfall, was attended by 160 delegates from five States. On the Thursday evening the Chairman (Mr. J. F. Walker) of the Victorian Section, who were hosts on this occasion, welcomed the delegates. The technical sessions, in which eight papers were delivered during the two working days, were opened by the Chairman of the Australian Federal Committee (Mr. J. R. Rischbieth).

The Auckland and Wellington Sections held a Convention at Wairakei from 14-16 August.

Council has received the monthly publication of the new Australian Oil and Colour Chemists' Association Proceedings and News during 1964, the President being pleased to have the opportunity of including a message of good wishes in the first issue in January.

The compilation of the History of the Association, undertaken by Mr. G. Copping (an Honorary Member and Past Honorary Editor), with Dr. S. H. Bell (President Designate and Vice-President) and Dr. H. A. Hampton (Past President, and the South African Section's Representative on Council), referred to in the Report of Council for 1962, has now been completed up to the date of incorporation. Following the October meeting of Council a notice was included in each member's copy of the November issue of the *Journal* so as to assess the likely demand for this publication and the matter will be further considered by the Council.

On the evening of 7 October, members of Council had the pleasure of receiving 11 Past Presidents (one of whom is also a Founder Member), four Past Honorary Officers and one other Founder Member at the Reunion Dinner at Wax Chandlers' Hall. After the dinner the President gave his customary review of the Association's activities during the year and then entertained the assembled company with a talk on early keyboard instruments, illustrating the talk not only with lantern slides but also with demonstrations on the virginals and harpsichord.

In October the Midlands Section held its first one-day Symposium under the title "The Electrodeposition of Paint." Before an audience of 155, four papers were presented together with the showing of two films. Lively discussion took place during both the morning and afternoon sessions and topics raised ranged over a wide field from practical points to the more erudite aspects of physical chemistry. A report of the Symposium appeared in the December issue of the *Journal* and it is hoped that some of the papers and discussions will be included in an issue of the *Journal* during 1965.

In 1964, members of the Association were accorded honour by other organisations; Honorary Membership of the Research Association of British Paint, Colour and Varnish Manufacturers was conferred upon Mr. W. E. Wornum, a Past President, in recognition of 31 years' service; Mr. P. Walker, Honorary Treasurer of the Thames Valley Branch of the London Section was awarded the City and Guilds Insignia Award.

During the year members attached to overseas sections have visited the Association's offices and the secretariat have been pleased to help them in many ways. Mr. A. R. Penfold (Honorary Member) arrived from Australia in November and hopes to attend several Association functions in the early part of 1965 in the United Kingdom.

A Past President, Mr. N. A. Bennett, made a business trip to Australia and New Zealand in the Autumn and took the opportunity of conveying good wishes from the Council to the Federal Committee and to the Sections; a Past Chairman of the Manchester Section, Mr. J. Smethurst, during a visit to South Africa had the opportunity of meeting representatives from the Association's Section there. Dr. H. A. Hampton (Past President) represented the President at the 4th Congress of the Federation of Scandinavian Paint and Varnish Technicians in Helsinki in October. Dr. A. Lowe (a member attached to the Manchester Section) conveyed greetings from the Association at the Convention of the Federation of Societies for Paint Technology in Chicago in November.

The Council was saddened during the year to hear of the deaths of two Founder Members of the Association, Dr. M. B. Blackler and Mr. T. M. Tyson; obituary notices appeared in the May and August issues of the *Journal* respectively. Council was also saddened to hear of the deaths of Mr. R. C. Crane, who was a Founder Member of the Bristol Section, and Mr. J. Milligan, the first Vice-Chairman of the Scottish Section; obituary notices appeared in the May and August issues respectively.

A Past President and Honorary Member of the Association, Dr. L. A. Jordan, died in December and an obituary notice will appear in the January 1965 issue of the *Journal*.

Earlier in the year, Council learned with regret of the sudden death of Mr. C. Homer Flynn, the Executive Secretary of the Federation of Societies for Paint Technology.

The Council places on record its grateful thanks to the General Secretary, Mr. R. H. Hamblin, and the members of his staff for their efforts in promoting the welfare of the Association.

Membership of the Association

The number of members elected during the year was 394 compared with 346 in 1963. The net increase in total membership was 153 compared with 70 in 1963.

Council notes with pleasure the considerable increase in Junior Membership and thanks all members who have been instrumental in encouraging applications and in fostering Student Group activities.

The list below shows the total strength of the Association as at 31 December 1964 :—

<i>Section</i>	<i>Ordinary</i>	<i>Associate</i>	<i>Junior</i>	<i>Honorary</i>	<i>Total</i>
Bristol (incl. Irish Branch) ..	114	27	5	—	146
Hull	74	15	4	—	93
London (incl. Southern and Thames Valley Branches) ..	833	162	33	4	1,032
Manchester	342	72	25	2	441
Midlands (incl. Trent Valley Branch) ..	186	39	18	2	245
Newcastle	147	23	12	—	182
Scottish (incl. Eastern Branch) ..	120	39	35	—	194
West Riding	61	16	6	—	83
General Overseas ..	305	23	3	1	332
Auckland	37	30	1	—	68
New South Wales ..	250	140	4	—	394
Queensland	31	31	3	—	65
South African	151	45	2	—	198
South Australian ..	47	29	2	—	78
Victorian	205	83	35	—	323
Wellington	44	19	—	—	63
West Australian ..	20	19	3	—	42
Total 1964	2,967	812	191	9	3,979
Total 1963	2,860	813	144	9	3,826
Net increase/decrease during 1964 ..	+107	—1	+47	—	+153

THE COUNCIL

During the calendar year the Council has met six times (once for a Special Meeting), the average attendance being 18. All meetings were held in London.

COMMITTEES OF COUNCIL

The Committees of Council met as set forth below :—

Exhibition Committee	4
Finance Committee	2
Publications Committee	2

EXHIBITION COMMITTEE

Chairman—The Honorary Treasurer, Mr. F. Sowerbutts

Although a full report of the Exhibition, collated by Mr. C. R. Pye, then Honorary Publications Secretary of the London Section, from reports by 37 members, appeared in the May issue of the *Journal*, the Council wishes to point out that at the Sixteenth Technical Exhibition the floor area of the stands exceeded previous years and to accommodate those wishing to exhibit it was necessary for certain of the exhibitors to reduce their space requirements. The total number of stands amounted to 97, representing 104 exhibitors, six of whom were com-

pletely new to the Exhibition. Once again there was an increase in the number of exhibitors from overseas and either directly or through United Kingdom subsidiaries, agencies or licensees nine overseas countries were represented and visitors from at least 30 countries are known to have come to the Exhibition. While the Exhibition was being prepared an unofficial ban on overtime, contrary to the working agreement, was imposed by the Shop Stewards at Earls Court which affected all other exhibition sites in the London area and also the contractors' factory workshops.

The Exhibition Luncheon was for the first time held at the Savoy Hotel, London, and in welcoming the 400 members, guests and exhibitors who attended the President had the unpleasant task of reporting in his Address of Welcome that even at that late hour there was no certainty that there would be any Exhibition to open that afternoon.

The Guest of Honour, the Right Honourable Lord Drumalbyn, Minister of State, Board of Trade, replied to the Address of Welcome. On arriving at the Royal Horticultural Society Old Hall he was able to perform the official ceremony of opening at least that part of the Exhibition on time. On the Wednesday morning the New Hall was also opened.

In pursuance of the Exhibition Committee's policy of encouraging technical education, parties of sixth form science students from schools in the London area were again invited to attend the Exhibition for introductory talks (given by Dr. S. H. Bell and Mr. A. T. S. Rudram) before being conducted round the Exhibition. The theme of the Technical Education Stand was "Analysis in the Surface Coatings Industries" and a special leaflet was compiled by Mr. J. A. L. Hawkey, Mr. K. Pond and Mr. H. C. Worsdall. The stand was again staffed by representatives from the Technical Colleges and the paint and printing ink industries.

FINANCE COMMITTEE

Chairman—The Honorary Treasurer, Mr. F. Sowerbutts

The market value of all investments at the end of the year, including the Ethel Behrens Fund, was £1,274 lower than the purchase price, compared with £631 higher than the purchase price at the end of 1963.

The Finance Committee has been much disturbed by the financial difficulties encountered during the year and the resulting deficit on the year's working of £214.

At the November Council meeting the Hon. Treasurer was asked to submit to Council, early in 1965, the Committee's recommendations concerning the building up of further reserves.

LIAISON COMMITTEE

Chairman—The President

During the year no formal committee meeting was held but the President took the opportunity afforded by his visit to the Congress of the Fédération d'Associations de Techniciens des Industries des Peintures, Vernis, Emaux et Encres d'Imprimerie de l'Europe Continentale at Vichy to discuss matters of common interest with the President of the Fédération d'Associations de Techniciens des Industries des Peintures, Vernis, Emaux et Encres d'Imprimerie de l'Europe Continentale, Mr. J. Petit; similarly Dr. H. A. Hampton was able to discuss co-operation with the Federation of Scandinavian Paint and Varnish Technicians during his visit to the Fourth Scandinavian Congress.

LIGHT FASTNESS COMMITTEE

Chairman—Mr. G. A. Campbell

There has been no meeting of the full Committee during the past year, as a sub-committee was appointed to advise on the present position of instrumentation in the measurement of colour changes.

It will be recalled that the Committee reported to Council last year that it considered that the work on its original terms of reference had been completed with the widespread acceptance and usage of the method of British Standard 1006 in the assessment of light fastness of pigmented surfaces. The terms of reference of the Committee were therefore extended to include

instrumentation, in order to ascertain whether the assessment might be undertaken by spectro photometric measurement instead of present subjective methods.

Owing to illness, the findings of the sub-committee have been somewhat delayed but meetings have been held; the next task the Light Fastness Committee will be to digest the sub-committee's report and to consider their recommendations.

PUBLICATIONS COMMITTEE

Chairman—The Honorary Editor, Mr. D. S. Newton

During 1964, 45 papers—an increase of 11 over 1963—were published, covering 1,042 pages of text. This increase was made possible by authors submitting useful papers on limited topics, which were therefore shorter than usual. This type of paper has the advantage that it can often be included in the *Journal* at an earlier date than a longer paper, which may have to wait until full space is available.

The pattern of papers by origin is given below and, as has been mentioned in previous reports, direct contributions still outnumber papers from Sections.

The Honorary Editor suggests that more advantage should be taken of facilities available to publish short contributions giving details of major works in progress, where this is of general importance. The amount of Correspondence has improved slightly during the year, but it is felt that a larger number of items under this heading could be included.

Survey of published papers :

(a) Sections	1963	1964
Australia and New Zealand	2	3
Bristol	1	—
Hull	—	1
London	3	5
Manchester	3	10
Midlands	1	1
Newcastle	1	1
Scottish	1	—
West Riding	—	—
(b) Direct (U.K.)	12	14
(c) Direct (Overseas)	—	10
(d) Conference	9	—
(e) Foundation Lecture	1	—
	<hr/>	<hr/>
	34	45
	<hr/>	<hr/>

From the subject aspect, it has been possible to keep a fairly well-balanced *Journal*.

The papers can be divided into subjects as follows :—

Paint	5
Pigments	6
Media	8
Dispersion	6
Analysis	13
Additives	2
General	1
Plastics	4
	<hr/>
	45
	<hr/>

TECHNICAL COMMITTEE

Chairman—The Honorary Research and Development Officer, Mr. A. T. S. Rudram

At the beginning of December, the newly-formed Technical Committee met informally at Nottingham University to discuss the progress of the Oil and Colour Chemists' Association

Fellowship. Dr. G. D. Parfitt reviewed the work of his various research students and Fellows on pigment/medium interactions, and Dr. K. E. Lewis, who holds the Oil and Colour Chemists' Association Fellowship, then described his first six months' work.

Rutile titanium dioxide dispersed ultrasonically in Aerosol OT solutions is being examined for stability to flocculation, using a variety of research techniques such as infrared spectroscopy, light scattering, electrophoresis, etc. A variety of factors such as adsorbed water on the pigment surface, the concentration of solutions, and the rates of flocculation related to energy barriers are being examined.

TECHNICAL EDUCATION COMMITTEE

Chairman—Dr. H. W. Keenan

As stated in the Annual Report for 1963 the activities of the Technical Education Committee have of necessity been limited during recent times since members of the Committee have been concerned individually with the publication of the last three Paint Technology Manuals and the Committee has been awaiting the results of the deliberations of the Technical Education Committee of the Paintmakers Association of Great Britain Limited.

It had been hoped that Volumes IV and V of the Paint Technology Manuals would appear during 1964, but this proved impossible; they are both scheduled to appear in 1965.

The Association was represented on other organisations as follows :

TECHNICAL TRAINING BOARD FOR THE PRINTING INK AND ROLLER MAKING INDUSTRY :
Mr. A. H. Soane, Mr. K. Pond and Dr. G. L. Fuchs.

PAINT APPRENTICESHIP COUNCIL : Dr. H. W. Keenan and Mr. G. Copping.

PAINT TRADE BENEVOLENT FUND : Mr. G. Copping and Mr. D. E. Roe.

THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE : The President and the Honorary Secretary.

THE BRITISH NATIONAL COMMITTEE FOR CHEMISTRY : The President.

CITY AND GUILDS ADVISORY COMMITTEE NO. 9—TECHNOLOGY OF PIGMENTS, PAINTS, VARNISHES AND LACQUERS : Dr. J. G. Gillan.

EAST HAM TECHNICAL COLLEGE ADVISORY COMMITTEE : Dr. H. G. Rains.

ASSOCIATION OF EXHIBITION ORGANISERS : The General Secretary.

PROGRAMME LIAISON COMMITTEE : The Honorary Secretary and the General Secretary.

THE PAINTMAKERS ASSOCIATION TECHNICAL EDUCATION COMMITTEE : The President or the Honorary Secretary.

THE SOCIETY OF DYERS AND COLOURISTS TERMS AND DEFINITIONS COMMITTEE : Dr. F. M. Smith and Mr. H. Cook.

BRITISH STANDARDS INSTITUTION :

Committee

PVC	..	..	..	Pigments, Paints and Varnishes Industry Committee	..	Dr. J. B. Harrison
PVC/1	..	..	..	Pigments	..	Mr. A. S. Lewis
PVC/1/11	..	..	..	Extenders	..	Mr. S. A. Ray
PVC/1/18	..	..	..	Zinc Dust Pigments	..	Mr. D. S. Newton
PVC/2	..	..	..	Paints	..	Mr. N. A. Bennett
PVC/2/7	..	..	..	Road Paints	..	Mr. T. R. Bullett
PVC/3	..	..	..	Oils, Varnishes, Putty, etc.	..	Dr. H. Jaspersen
PVC/4 & PVC/4/1	..	..	..	Lac	..	Mr. A. J. Gibson
PVC/8	..	..	..	Plastic Wood	..	Mr. V. P. Gellay
PVC/10	..	..	..	Test Methods for Paints	..	Mr. T. E. Johnson
PVC/15	..	..	..	Water Paints and Distempers	..	Mr. T. W. Wilkinson
PVC/19	..	..	..	Bituminous Paint	..	Mr. C. Montague Smith
PVC/20	..	..	..	Calcium Plumbate Priming Paints	..	Mr. W. E. Green*

BRITISH STANDARDS INSTITUTION—*continued*

LGE/9	..	..	Artificial Daylight for Colour Matching	Miss D. L. Tilleard
LGE/19	..	..	Colour Terminology	Dr. J. G. Gillan
C/17	..	..	Viscosity	Miss D. L. Tilleard
C/17/2	..	..	Revision of BS 188 (Drafting)	Miss D. L. Tilleard
CHE/43	..	..	Test Sieves	Mr. A. Pass
CHE/50	..	..	Test Methods for Powder Properties	Dr. J. G. Rigg
CIC/4	..	..	Solvents and Allied Products	Mr. H. W. Rudd
OSC/6	..	..	Glycerine	Mr. M. R. Mills
OSC/7	..	..	Sampling Oils and Fats ..	Mr. M. R. Mills
OSC/12	..	..	Vegetable Oils	Mr. W. V. Lee
OSC/24	..	..	Analysis of Oils, Fats and Soaps	Mr. W. V. Lee
ELE/16/6	..	..	Varnishes	Mr. L. Massey
ACE/44	..	..	Aircraft Finishes	Mr. J. B. G. Lewin
BLC/18	..	..	Code of Practice : Painting ..	Mr. P. J. Gay
BLC/18/1	..	..	Code of Practice : Painting on Wood	Mr. P. J. Gay
M/36	..	..	Artists' Materials	Dr. L. A. Jordan*
RDE/25	..	..	Road Marking Compounds ..	Mr. T. R. Bullett

*Died during the year

Reports of these representatives may be seen by members at the Association's offices.

The Association was also represented on overseas organisations as follows :

PAINT AND VARNISH SECTIONAL COMMITTEE OF STANDARDS ASSOCIATION OF AUSTRALIA :
Mr. K. S. Jones.

POLYMER SCIENCE ADVISORY PANEL OF UNIVERSITY OF NEW SOUTH WALES : Mr. J. H. Foxton.

AUCKLAND BRANCH OF THE AUSTRALASIAN CORROSION ASSOCIATION : Mr. F. J. Aitken-Smith.

AUCKLAND PLASTICS INSTITUTE : Mr. W. Rain.

1 January 1965.

Oil and Colour Chemists' Association

(Incorporated 1 January 1963 as a company limited by guarantee and not having a share capital)

BALANCE SHEET as at 31 December 1964

<p>1963 £</p> <p>ACCUMULATED FUND— Balance at 31 December 1963 33,136 Add Capital Distributions arising on investments 5 Funds held by Overseas Sections —per Contra 800</p> <p style="text-align: right;">33,941</p> <p>Deduct Deficit for the year .. 214</p> <p>33,136</p> <p>2,442</p> <p>ETHEL BEHRENS FUND— CURRENT LIABILITIES— Creditors and Accrued Liabilities 1,296 14,490 Receipts in Advance .. 17,127 Reserve for Research Project 1,560 Reserve for Paint Tech- nology Manuals .. 517 906 United Kingdom Income 178 Tax 252</p> <p>18,177</p> <p>Note: Exchange: Currency assets and lia- bilities have been converted at the rates ruling at 31 December 1964</p> <p>J. E. ARNOLD <i>President</i></p> <p>F. SOWERBUTTS <i>Hon. Treasurer</i></p>	<p>£ £</p> <p>33,136</p> <p>2,442</p> <p>1,296</p> <p>17,127</p> <p>1,560</p> <p>517</p> <p>252</p> <p>20,752</p> <p>£56,921</p>	<p>1963 £ £</p> <p>FIXED ASSETS Furniture, Fittings and Office Machines at Cost 4,082 Less Accumulated De- preciation 3,004</p> <p>1,323</p> <p>INVESTMENTS— British and Local Authority Securities at Cost (Market Value £17,217) 17,908 Other Investments at Cost (Market Value £9,419) 9,860</p> <p>17,908</p> <p>7,729</p> <p>25,637</p> <p>ETHEL BEHRENS FUND— Local Authority Security at Cost (Market Value £2,300) 2,442</p> <p>2,442</p> <p>CURRENT ASSETS— STOCK OF UNSOLD PUB- LICATIONS as valued by the Honorary Officers 396 PAPER—Stock in Hand at Cost 1,353 DEBTORS AND PAYMENTS IN ADVANCE 5,064 FUNDS HELD BY AUS- TRALIAN FEDERAL COM- MITTEE (Estimated) .. 519</p> <p>582</p> <p>1,054</p> <p>4,520</p> <p>769</p> <p>CASH AND BANK BALANCES— United Kingdom £13,775 Overseas Sections: Auckland 228 New South Wales 850 Queensland 147 South African 506 South Australian 139 Victorian 723 Wellington 192 West Australian 99</p> <p>17,428</p> <p>24,353</p> <p>16,659</p> <p>23,991</p> <p>ADDITIONAL FUNDS HELD BY OVERSEAS SECTIONS— Victorian 392 Queensland 24 New South Wales 384</p> <p>800</p> <p>£53,755</p>	<p>£ £</p> <p>4,924</p> <p>3,004</p> <p>1,920</p> <p>17,908</p> <p>9,860</p> <p>27,768</p> <p>2,442</p> <p>396</p> <p>1,353</p> <p>5,064</p> <p>519</p> <p>£13,775</p> <p>228</p> <p>850</p> <p>147</p> <p>506</p> <p>139</p> <p>723</p> <p>192</p> <p>99</p> <p>16,659</p> <p>23,991</p> <p>392</p> <p>24</p> <p>384</p> <p>800</p> <p>£56,921</p>
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REPORT OF THE AUDITORS TO THE MEMBERS

The above balance sheet and annexed income and expenditure account are in agreement with the books which, in our opinion, have been properly kept. Annual accounts submitted by the United Kingdom and Overseas Sections have been incorporated in these accounts but the assets, liabilities and expenditure included therein have not been verified by us. No accounts have yet been received from the Australian Federal Committee for 1964 and their costs have therefore had to be estimated and charged in the income and expenditure account in the sum of £550. The market value of the investments shows a deficiency, compared with cost, of £1,274, for which provision has not been made in these accounts. Subject to these remarks we obtained the information and explanations we required and in our opinion the accounts comply with the Companies Act 1948, and give a true and fair view of the state of affairs and the results of the Association.

COOPER BROTHERS & CO.
Chartered Accountants.

London, 6 April 1965.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31 DECEMBER 1964

1963				1963			
£		£	£	£		£	£
	JOURNAL EXPENSES—			11,291	MEMBERS' SUBSCRIPTIONS ..		11,788
	Printing and Publication ..	15,028		120	ENTRANCE FEES		147
15,613	Postage	1,697	16,725	14,920	ADVERTISEMENT REVENUE ..		13,952
	PUBLICATION EXPENSES—				SALES :		
	Printing	609		6,170	<i>Journal</i>	6,589	
	Reprints	524		675	Other Publications	441	
1,318	Editorial	54	1,187	598	Reprints	787	
	SECTION EXPENDITURE—			7,443			7,817
	Auckland	59		1,291	INCOME FROM INVESTMENTS (GROSS)		1,578
	Bristol	122		95	ETHEL BEHRENS FUND INCOME		
	Hull	122			FROM INVESTMENTS (GROSS) ..		135
	London	619		7,699	EXHIBITION EXCESS OF RECEIPTS ..		7,798
	Manchester	161			OVER PAYMENTS		
	Midlands	125			ROYALTIES AND EDITORIAL WORK		
	Newcastle	118			IN RESPECT OF PAINT TECH-		
	New South Wales	519		488	NOLOGY MANUALS		106
	Queensland	97			SURPLUS ON SALE OF OFFICE		
	Scottish	137		6	FURNITURE		16
	South African	114			PROVISION AGAINST DEBT NO		
	South Australian	177		—	LONGER REQUIRED		18
	Victorian	369		—	DEFICIT FOR YEAR		214
	Wellington	91					
	West Riding	144					
3,174	West Australian	92	3,066				
	AUSTRALIAN FEDERAL COMMITTEE						
240	EXPENSES—(ESTIMATED) ..		550				
96	SCARBOROUGH CONFERENCE ..						
75	DINNER-DANCE		24				
139	PAST PRESIDENTS' DINNER ..		152				
	PROVISION FOR PRESIDENT'S						
95	FATIEPEC EXPENSES		135				
	ADMINISTRATIVE EXPENSES—						
	Salaries, National In-						
	surance and Staff						
9,602	Pension Scheme	10,818					
285	Temporary Staff	278					
502	Welfare	577					
	Rent, Rates, Lighting,						
2,537	Telephone	2,475					
1,174	Printing and Stationery	1,411					
1,201	Postages	986					
2,052	Other Expenses	1,962					
17,353			18,507				
94	AUDIT FEES		121				
286	INCORPORATION EXPENSES ..		12				
1,500	RESERVE FOR RESEARCH PROJECT		1,560				
	DEPRECIATION ON FURNITURE AND						
430	FITTINGS AND OFFICE MACHINES		524				
153	FOUNDATION LECTURE		106				
55	PROVISION FOR BAD DEBTS ..		26				
	RESERVE FOR PAINT TECHNOLOGY						
300	MANUALS		100				
50	RESERVE FOR DILAPIDATIONS ..		50				
—	HISTORY OF ASSOCIATION ..		39				
534	UNITED KINGDOM INCOME TAX ..		685				
1,848	SURPLUS FOR THE YEAR		—				
<u>£43,353</u>			<u>£43,569</u>	<u>£43,353</u>			<u>£43,569</u>

Section Annual Reports

(The following reports are based on those approved by Section Annual General Meetings, and they have been edited in order to preserve a unity of style.)

Auckland

Honorary Officers and Committee

At the Seventh Annual General Meeting on 26 February 1964 the following members were elected to office :

Chairman	Mr. F. J. Aitken-Smith
Hon. Secretary	Mr. C. W. Pritchard
Hon. Treasurer	Mr. J. M. Willis
Hon. Publications Officer	Mr. T. Whitfield
Past Chairman (<i>ex officio</i> member)	Mr. A. Partridge

Committee :

Mr. M. Elliott, Mr. M. McCall, Mr. G. Patchett, Mr. P. Stephenson, Mr. P. Hunt, Mr. R. McCapra.

During the year Mr. Pritchard left Auckland and his place has since been taken by Mr. Hunt.

A total of six Committee Meetings were held during the year with an average attendance of ten members.

The Chairman said he would like to convey to the Committee his thanks for their support during his term of office and for the conscientious way in which they have carried out their duties. To the Shell Company he extended special thanks for their generous assistance in providing the Committee with a meeting place.

Membership

Membership at 31 December 1964 stood at 69 and comparative figures for the previous year are as follows :

	1963	1964
Ordinary	33	37
Associate	26	30
Junior	3	2
	<hr/>	<hr/>
	62	69
	<hr/>	<hr/>

Meetings

General Meetings held during the year included visits to Forest Products and to the Auckland Drainage Board Plant at Mangare. It is hoped to arrange further factory visits during the coming year.

Student activities

During the year a course in Paint Technology was introduced and is proving most successful. Thanks are due to Mr. T. Whitfield and Mr. M. Willis.

Finance

To the Hon. Treasurer, Mr. M. Willis, he wished to convey thanks for the way in which he has handled the Section's affairs in spite of his other commitments. He was happy to announce that he has consented to retain his office for a further year. He will be presenting his own report.

As yet, the chemical in this laboratory mock-up is commercially unborn. But like so many substances formulated by DCL in experimental quantities, it may be tomorrow's Bisol chemical in world demand. DCL have all the facilities to offer customers product research assistance, and to scale-up pilot plant output to tonnage production. DCL supplies chemicals in bulk, in drum, or 'specials' by the gallon.

THE DISTILLERS COMPANY LIMITED • CHEMICALS & PLASTICS GROUP
 Bisol Sales Office • Devonshire House • Piccadilly • London W1
 (MAYfair 8867)

chemicals at speed, in bulk or drum

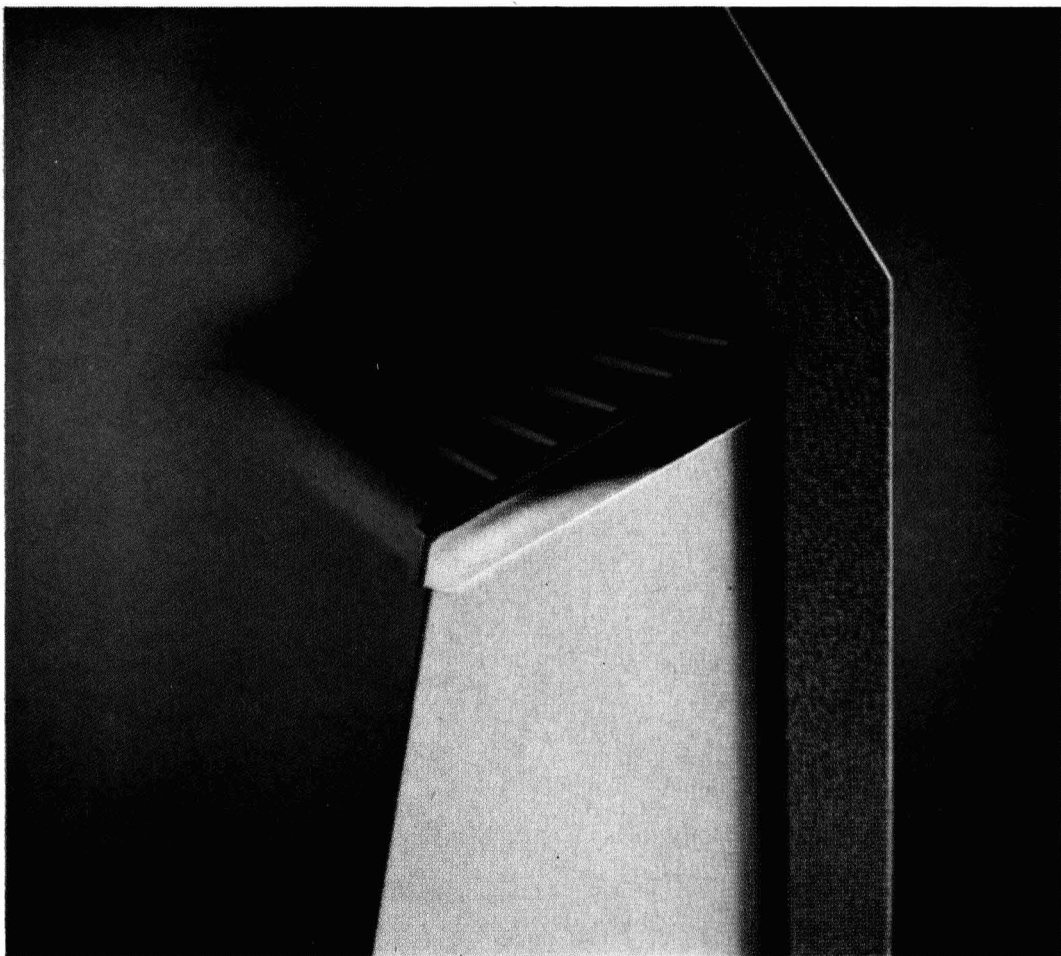


ALCOHOLS • KETONES • PLASTICISERS
 ESTERS • MONOMERS • ORGANIC ACIDS

Chemical
 Eye view

tomorrow
 in
 embryo





RESISTING HIGH TEMPERATURES IS CARDURA'S PROBLEM - NOT YOURS

Paints based on Cardura resins retain their perfect finish whatever the temperature. Yellowing due to heat ageing or overbaking is virtually eliminated: colour and gloss defy chemical or physical action, stains or mechanical damage. Cardura's high solids content makes it possible to obtain thicker films quickly and easily. Could this flexible combination of virtues solve your paint problems, whether as a resin intermediate (Cardura E) or as a developed resin (Cardura 30 or 40)? If so, talk to your Shell Company about Cardura.

For further information consult your Shell Company (in the U.K., apply to Shell Chemical Company Limited, Shell Centre, Downstream Building, London SE1).

CARDURA

Shell Chemicals



Social events

The Ladies' Night, held on 9 October at the Flamingo, was a very pleasant social occasion. A sub-committee has already been appointed to ensure that this year's celebration is even more successful.

In past years Ladies' Night has been the Section's main social event, but with the establishment of the Annual Convention as a regular fixture, we can look forward to this as perhaps the highlight of the year. Once again it is being held at Wairakei, at the weekend of 13 to 15 August. It is Auckland's turn to play host this year and they were eager to ensure that it was as successful as 1964. It was wrong to regard it as purely a social event since some excellent papers were given and some fruitful discussions held with the Wellington members. Nevertheless it is a fixture at which wives can be present and where the social side is by no means overlooked.

Acknowledgments

Finally, the Chairman wished to thank all members of the Auckland Section for the way in which they had supported him and the Committee during the past two years.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS			
1963		1964		1963		1964	
£	s.	d.	£	s.	d.	£	s.
—	—	—	3	3	0	142	18
36	0	0	20	0	0	174	16
1	5	2	1	2	7	1	10
2	0	0	2	0	0	4	13
1	17	5	1	16	6	—	—
7	11	6	8	16	8	—	—
—	—	—	5	8	0	—	—
24	6	6	5	0	0	—	—
—	—	—	14	2	6	—	—
—	—	—	38	0	0	—	—
—	—	—	5	0	0	—	—
—	—	—	2	0	0	—	—
—	—	—	15	18	0	—	—
75	0	0	112	0	0	—	—
172	2	9	227	13	4	—	—
2	8	6	—	—	—	—	—
£323	19	4	£462	0	7	£323	19
							4
							£462
							0
							7

Audited and found correct.

Bankers: Bank of New South Wales, Queen Street, South, Auckland. C.1.

Bristol

Honorary Officers and Committee

At the Annual General Meeting on Friday 24 April 1964, the following were elected:

Chairman	..	..	..	..	Mr. L. J. Brooke
Chairman Elect	..	..	..	..	Mr. R. J. Woodbridge
Hon. Secretary	..	..	..	..	Mr. D. N. Fidler
Hon. Treasurer	..	..	..	..	Mr. W. J. McWaters
Hon. Publications Secretary	..	..	..	..	Mr. L. Tasker
Hon. Research and Liaison Officer	..	..	..	..	Mr. L. Tasker
Representative on Council	..	..	..	..	Mr. R. J. Woodbridge

Committee :

The Committee has consisted of the above, together with Mr. I. S. Cox, Mr. R. Dennis, Mr. P. L. Gollop, Mr. C. G. Phillimore, Mr. F. E. Ruddick (co-opted) and Mr. J. R. Taylor.

The Committee has met five times during the session and the attendance at these meetings was as follows : Mr. L. J. Brooke (5), Mr. P. L. Gollop (2), Mr. L. Tasker (3), Mr. I. S. Cox (5), Mr. W. J. McWaters (4), Mr. J. R. Taylor (5), Mr. R. Dennis (4), Mr. C. G. Phillimore (4), Mr. R. J. Woodbridge (4), Mr. D. N. Fidler (5), Mr. F. E. Ruddick (3).

Membership

The membership as at 31 December 1964, was 146 and this was made up as follows :

<i>Bristol Section</i>					1964	1963
Honorary Members	..	..	..	..	Nil	Nil
Ordinary Members	..	..	..	..	81	81
Associate Members	..	..	..	..	13	16
Junior Members	..	..	..	..	5	10
					—	—
					99	107
					—	—
<i>Irish Branch</i>						
Honorary Members	..	..	..	..	Nil	Nil
Ordinary Members	..	..	..	..	33	35
Associate Members	..	..	..	..	14	11
Junior Members	..	..	..	..	Nil	Nil
					—	—
					47	46
					—	—

Meetings

The following meetings were held during the session, at the Royal Hotel, College Green, Bristol 1, except where indicated.

The lectures were arranged on the overall theme of "Painting and Printing and the Substrate."

1964

25 *September* : "Theoretical Aspects of Adhesion," by Dr. W. J. Dunning, University of Bristol (38).

30 *October* : "Printability of Paper and Board," by Miss E. J. Pritchard, PATRA (29).

27 *November* : "Painting of Plasters," by Mr. H. A. Smythe, Mr. J. A. Hare, Mr. F. G. North, British Gypsum Limited (42). This was a joint meeting with the Birmingham Paint, Varnish, and Lacquer Club, held at the Hawthorns Hotel, Bristol. The meeting was preceded by dinner, at which 12 members of the Birmingham Club were guests of the Bristol Section.

1965

15 *January* : "Printing and Coating on Plastic Films" by Mr. T. Sutcliffe, Colodense Limited (44).

29 *January* : "Painting and Coating Wood Chipboard," by Mr. L. E. Akers, Mr. R. P. Best, Aircrow-Weyroc Limited (19).

26 *February* : "Printing and Coating on Aluminium Foils," by Mr. J. R. Green, Star Aluminium Co. Ltd. (36).

26 *March* : "Some Aspects of the Painting of Non Ferrous Metals," by Mr. A. T. S. Rudram, The Paint Research Station (25). This meeting was held at the Royal Hotel, Cardiff.

30 *April* : Annual General Meeting and Dinner. Held at the Hawthorns Hotel, Bristol.

The Section wishes to thank the authors of the various papers, and all those who took part in the interesting discussions.

Social Events

The Annual Skittles match with the Birmingham Paint, Varnish and Lacquer Club was held on Friday 29 May 1964, at "Ye Olde Hob Nails," Little Washbourne. As usual this was a most enjoyable evening, and for the second year in succession, the "Alkyd Cup" was won by the Birmingham side.

After being postponed because of bad weather conditions, the Annual Dinner Dance of the Section was held on Friday 9 April 1965, at the Ashton Court Country Club. The Section was honoured to include among its guests the General Secretary of the Association, Mr. R. H. Hamblin and Mrs. Hamblin. The evening was a great success, and the thanks of the Section are due to the Dance sub-committee : Mr. W. J. McWaters, Mr. R. A. Davis and Mr. B. Cryer.

The 1964/1965 session was the 21st Anniversary Year of the Section, and to specially mark the occasion, the Annual General Meeting, at the Hawthorns Hotel, Bristol, was followed by a Dinner. The Section was delighted to have the company of the President of the Association, Dr. J. E. Arnold, and the General Secretary, Mr. R. H. Hamblin, for this occasion.

Acknowledgments

Three members of the Committee resign at the AGM, Mr. R. Dennis and Mr. P. L. Gollop by virtue of seniority, and Mr. F. E. Ruddick who was co-opted and is eligible for re-election; and the Section wishes to thank these gentlemen for their period of service, Mr. R. H. Hamblin and his colleagues for their willing help and co-operation at all times.

The Committee wishes to express its thanks to Messrs. John Hall and Sons (Bristol and London) Limited, for their kind hospitality in providing facilities for holding Committee meetings.

FINANCIAL STATEMENT 1964

1963			1964			1963			1964				
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.		
PAYMENTS													
<i>Meetings :</i>													
25	8	1	Hire of Rooms	18	6	3							
6	0	0	Projector Hire	8	13	0							
—	—	—	Social Functions	129	10	10							
<i>General Expenses :</i>													
7	9	8	Printing	3	9	2							
1	19	0	Postage	1	2	6							
—	—	—	Cheque Book	4	0	0							
4	12	9	Sundries	—	—	—							
<i>Entertainment :</i>													
5	7	6	Lecturers	16	17	0							
<i>Council Grants :</i>													
70	0	0	Irish Branch	60	0	0							
111	1	0	Balance per Cash Book	131	5	5							
<hr/>			<hr/>			<hr/>			<hr/>				
£231	18	0		£369	8	2	£231	18	0		£369	8	2

Creditors at 31 December 1964, Nil.

Fixed Assets, £1.

Audited and found correct

C. C. PEARCE
Hon. Auditor.

Debtors at 31 December 1964, Nil.

Bankers : National Provincial Bank Ltd.,
Corn Street, Bristol 1.

W. J. McWATERS
Hon. Treasurer.

Irish Branch

Honorary Officers and Committee

At the Third Annual General Meeting, held on 20 March 1964, the following Officers and Committee were elected :

Chairman	Mr. M. O'Callaghan
Hon. Secretary	Mr. R. Adam
Hon. Treasurer	Mr. R. F. Cotter
Hon. Publications Secretary	Mr. F. D. H. Sharp

Committee :

Mrs. H. F. Stokes, Mr. E. McKeirnan, Mr. J. H. A. Quick, Mr. S. E. Saunders,
Mr. R. C. Somerville.

During the session Mr. D. F. J. Campion was co-opted to the Committee. Four Committee meetings were held during the year.

Membership

The membership at 31 December 1964 was as follows :

	1963	1964
Ordinary	36	33
Associate	12	14
	<hr/>	<hr/>
	48	47
	<hr/>	<hr/>

Programme of Meetings

The following programme of Branch Meetings was held during this session and the Committee wishes to record its gratitude to those who presented papers and to those companies who made the services of their staffs freely available.

1964

25 September : " Grinding Wetting and Dispersion," by Mr. G. Wadham (39).

30 October : " Modern Plant and Materials for Finishing and Painting Automobiles," by Mr. J. Walker (33).

7 November : " Native Irish Timber," by Mr. T. Ferguson. (Irish Institute for Industrial Research and Standards) (22).

1965

29 January : " Electrophoresis," by Mr. A. G. North (15).

17 February : Works visit : Fifteen members were the guests of Clondalkin Paper Mills Ltd., who arranged a most interesting tour of their works (15).

26 March : " Forensic Science in the Detection of Crime," by Det. Sgt. Eamonn O'Fiachain, of the Garda Technical Bureau (22).

26 March : Annual General Meeting.

Social event

The second Annual Dinner-Dance was held at the South County Hotel, Dublin. Seventy-three members and guests attended what proved to be a most successful evening.

FINANCIAL STATEMENT 1964

PAYMENTS			RECEIPTS		
1963		1964	1963		1964
£ s. d.		£ s. d.	£ s. d.		£ s. d.
	<i>Meetings :</i>			Balance brough forward ..	96 5 1
	Hire of rooms, refreshments,		4 7 1	Grants from Council ..	60 0 0
	reporting, hire of projector		70 0 0	Debtors brought forward ..	5 5 0
26 13 0	etc.	33 9 9	66 15 2	Social Functions	— — —
5 5 0	Creditors brought forward ..	66 15 2	65 11 0		
66 15 2	<i>Social Functions</i>				
	<i>General Expenses :</i>				
	Printing, Stationery, postage,				
	telephone, bank charges and				
1 7 3	sundries	8 12 2			
	<i>Entertainment :</i>				
10 7 9	Lecturers	30 8 1			
96 5 1	Balance per Cash Book ..	22 4 11			
<hr/>		<hr/>	<hr/>		<hr/>
£206 13 3		£161 10 1	£206 13 3		£161 10 1

Audited and found correct

Bankers : The Munster & Leinster Bank Ltd.,
Grafton Street, Dublin 2.

R. F. COTTER
Hon. Treasurer.

Hull

Honorary Officers and Committee

At the 21st Annual General Meeting of the Section, held on 3 April 1964, in the Newland Park Hotel, the following Officers were elected.

Chairman	Mr. A. J. Ford	(4)
Vice-Chairman	Mr. H. Reagan	(4)
Hon. Secretary	Mr. R. N. Parkinson	(4)
Hon. Treasurer	Mr. S. S. Done	(1)
Hon. Publications Officer	Mr. W. A. Rutherford	(4)
Hon. Research and Development Officer	Mr. C. C. Mell	(4)
Representative on Council	Mr. E. Armstrong	(3)
Hon. Social Secretary	Mr. L. W. Wynn	(4)
Hon. Lanternist	Mr. J. E. Gilroy	
Hon. Auditor	Mr. F. S. Wilson	

Committee

Mr. T. J. Biggs (2), Mr. A. Fillingham (2), Mr. P. Mell (4), Mr. A. Pipes (2), Mr. D. C. Summer (4), Mr. A. E. Webster (3).

The Committee met four times during the session, attendance of members indicated in parentheses.

Membership

At 31 December 1964 the membership was :

	1963	1964
Ordinary	69	73
Associate	16	15
Junior	3	2
	—	—
	88	90
	—	—

Meetings

Nine Ordinary Meetings were held during the session, attendance shown in parentheses.

1964

28 September : "A Method for Establishing the Acceptability of Colour Matches," by Mr. A. J. Ford (48).

2 November : "Questions and Answers." A joint meeting with the Hull Branch of the NFMP (Hosts OCCA) (32).

17 November : A discussion of the paper "Blistering of Paint Layers as an Effect of Swelling" (JOCCA, January 1964) (16).

7 December : "Fish Oils and their Constituents, Processing and some Industrial Application," by Mr. S. A. Reed. A joint meeting with the SCI (hosts OCCA) (45).

1965

4 January : "Linseed Oil Putty, A Simple System," by Mr. R. R. Davidson (36).

11 January : A discussion evening, "Gloss, Opacity and Colour" (46).

1 February : "Colour Matching, from an Art to a Science," by Mr. J. L. R. Landry (23).

16 February : "Colour, a Brief Survey," by Mr. W. B. Cork. (A joint meeting with the HCES (hosts HCES.)

1 March : "The Use of the Daniels Flowpoint Technique as a Guide to Methods of Manufacturing Paints and Printing Inks Pigmented with Titanium Dioxide," by Mr. D. G. Dowling (20).

The total attendance of members was 170, approximate average attendance 20 per cent. It is worth noting that although Hull is a comparatively small section, three papers have been presented during the year by members of the Section.

Social events

The only item of importance was the dance, held on 12 October 1964. This was socially very successful. It was attended by 116 people, unfortunately, once again, less than the previous year.

The Committee believes that some consideration will have to be given to this in the coming few months to see what can be done to improve numbers and even to see whether an increase in the price of tickets is necessary.

Research and Development

At a meeting held on 5 May 1964 the Committee agreed to commence a Co-operative Research Project on the acceptability of colour differences. This matter was further discussed at subsequent Committee Meetings and following Mr. Ford's lecture on a method of assessing the acceptability of colour matches, a Sub-Committee was formed to supervise the project. The members appointed were : Mr. A. J. Ford, Mr. C. C. Mell, Mr. W. B. Cork, Mr. P. N. Willis, Mr. R. Parkinson.

Two meetings of this Sub-Committee have been held this session at which the preliminary details of the project were discussed.

The object of the work is to :

- (a) In a set of colour patterns consisting of small colour differences from a standard pattern, to determine the area within which the patterns are considered acceptable.
- (b) To determine the area of acceptance when the original standard pattern is replaced by other patterns of slightly different colour.

In both cases the colour matches to be judged as a commercial decorative paint match. The project will be confined to four basic colours, each series at a constant luminance.

A start has been made in the preparation of the first series of colour patterns and within the next few weeks these will be circulated to members who have agreed to organise the observer groups. This first series has been designed to prove :

- (a) The correctness of that method of presentation and the order of the patterns.
- (b) The adequacy or otherwise of the administrative details.

Progress on this project will of necessity be slow, mainly owing to the fact that the work in the preparation of the paints and the patterns cannot be shared out among members. As the project progresses, a wider group of members will be able to assist in analysing the results and drawing the necessary conclusion.

Publications

The Hon. Publications Officer reported that from the 1964/65 session, just completed, there were available two papers which he hoped to offer for publication in the *Journal*.

Firstly, there was the paper by the Chairman, Mr. A. J. Ford, entitled "A Method for Assessing the Acceptability of Colour Matches," read before the Section in September 1964, and which coincided with the inauguration of a two-year co-operative research programme in the Hull Section on the acceptability of colour matches. This paper was being re-written and would shortly be available to offer for publication.

Secondly, the paper by Mr. S. A. Reed on "Fish Oils, their Composition, Processing and Industrial Applications, read before the Section in December 1964, was being re-written to make it suitable for publishing and it was hoped to have this available soon.

Thirdly, a further paper on electrodeposition by Mr. S. R. Finn jointly with Mr. J. A. Hasnip had been offered direct for publication. This paper, entitled "Electrodeposition, A Current Time Relationship," had now been accepted by the Hon. Editor for publication in the *Journal*.

Acknowledgments

The Section wishes to express its thanks to the speakers, Companies and Associations who have helped to make the year's meetings successful. The Chairman and Committee also wish to thank Mr. R. N. Parkinson for his three years office as Hon. Secretary and Mr. L. W. Wynn for his service as Hon. Social Secretary, both of whom are retiring from office although both will continue to serve, Mr. L. W. Wynn as Vice-Chairman and Mr. R. N. Parkinson as a Committee Member.

Thanks are also due to Mr. A. Pipes who retires from the Committee after three years and to other Officers and members who have served during the past year.

FINANCIAL STATEMENT 1964

Table with columns for PAYMENTS and RECEIPTS, split into 1963 and 1964. Includes sub-sections like Meetings, Social Functions, and General Expenses. Total payments: £274 3 3; Total receipts: £311 11 1.

London

Honorary Officers and Committee

The following Honorary Officers were elected at the 26th Annual General Meeting, held at the Criterion-in-Piccadilly, London, W.1, on Thursday 23 April 1964 :

List of Honorary Officers and Committee members: Chairman (Mr. M. R. Mills), Hon. Secretary (Mr. R. N. Wheeler), Hon. Treasurer (Mr. J. E. Pooley), Hon. Publications Officer (Dr. V. T. Crowl), Hon. Programmes Officer (Mr. A. R. H. Tawn), Hon. Auditor (Mr. W. H. Campbell).

As the result of a ballot, Mr. J. R. Berry, Mr. K. D. C. Bruce and Mr. D. E. Eddowes were elected to fill vacancies on the Committee. (203 valid voting papers were received, two having been disqualified and one having arrived too late.)

Committee :

Mr. J. R. Berry (8), Mr. K. D. C. Bruce (7), Mr. R. R. Davidson (4), Mr. D. E. Eddowes (7), Mr. W. O. Nutt (6), Mr. P. J. Whitaker (5), Mr. P. Targett (Southern Branch Representative on London Section Committee) (4), Mr. W. J. Arnot (Thames Valley Branch Representative on London Section Committee) (7).

Eight Committee Meetings were held during the session, individual attendances being shown by the figures following members' names.

At the first Committee Meeting of the session held on Thursday 21 May 1964, Mr. R. R. Davidson was appointed to fill the vacancy resulting from Dr. Crowl's election to Hon. Publications Officer. Mr. Nutt was appointed London Section Representative on Council and Mr. Eddowes accepted the appointment of Student Group Liaison Officer. It was decided that a Vice-Chairman should not be appointed at that stage but that the matter would be deferred until September when the position regarding Mr. C. R. Pye's health would be clearer. Mr. Pye was subsequently elected Vice-Chairman at the Committee Meeting held on Wednesday 23 September 1964.

Membership

During 1964, membership increased slightly, the largest percentage increase being in Junior membership. There was a loss of 38 members through resignations and deaths and 27 transfers to other Sections during the year. Figures on 31 December for the previous two years compared with those for 1964 are given below :

					1964	1963
Honorary	..	..	..	..	4	4
Ordinary	..	..	..	..	834	813
Associate	..	..	..	..	162	159
Junior	..	..	..	..	33	23
					<hr/>	<hr/>
					1033	999
					<hr/>	<hr/>

Meetings

1964

23 September : "The Assessment of Process Inks," by Mr. J. M. Adams.

22 October : "Inherent Properties of Paint Latex Films in Relation to their Performance," by Mr. H. Oosterhof.

12 November : "Mould Resistance of Paints in the Tropics," by Mr. P. Whiteley (Building Research Station).

9 December : "The Use of Furoic Acids in Alkyds," by Mr. V. Jenkins.

1965

17 February : "Dirt Pick-up of Paints," by Mr. G. L. Holbrow (Paint Research Station).

18 March : *European Liaison Lecture* : "The Interaction between Paint or Varnish and the Substrate," by Dr. Van Loon (TNO).

Average attendance at these meetings was 45 members and 12 guests which represents a reduction on last year's figures.

European Co-operation

Following an exhortation by Mr. Gibson at the Annual General Meeting in 1962, the London Section Committee decided to set up a scheme for an interchange of lecturers with European Paint Associations. This has now come to fruition and the first lecture under the new scheme was given by the Chairman in Copenhagen on 20 January 1965, before 75 members of the Danish Varnish and Paint Chemists' Association, the title of the paper being "The Chromatography of Paint Oils."

The first overseas lecturer to visit this country was Dr. Van Loon of TNO who gave a paper to the Section on 18 March 1965, on "The Interaction between Paint or Varnish and the Substrate."

The European Liaison Scheme has, therefore, got off to a good start during the present session.

Paint versus corrosion

On Thursday 7 January, the Section held a highly successful Symposium at Imperial College which was attended by 160 people consisting of 105 members and 55 non-members. Mr. A. T. S. Rudram acted as Technical Chairman and the following papers were presented : "New Leadless Anti-corrosive Primers," by Dr. J. B. Harrison and Mr. J. K. Barraclough ; "Polarisation Techniques for the Study of Corrosion Inhibition and their Application to Painted Specimens," Mr. H. F. Clay ; "Some Investigations into the Protective Mechanism of Zinc Dust Primers," by Mr. D. S. Newton and Mr. F. G. Sampson.

The technical discussions after each paper were of a high standard and the Symposium ended with a general discussion followed by a summing-up by Mr. Rudram and a warm vote of thanks to the authors of the papers.

Student Group activities

In accordance with the decision taken at the first Committee Meeting, Mr. Eddowes arranged a

series of lectures at different Technical Establishments more with the idea of attracting new members than catering for our own Junior members. Details of these were as follows :

<i>Subject</i>	<i>Lecturer</i>	<i>Location</i>	<i>Date</i>
“ Training for careers in the Paint Industry ”	Dr. S. H. Bell and Mr. G. Lumb	Borough Polytechnic (Joint meeting with Borough Oil and Colour Students' Assn)	8 October, 1964
“ Modern Chromatographic methods ”	Mr. D. Marshall	East Ham Technical College	1 December 1964
“ Some Aspects of Rheology ”	Mr. R. W. Wharlow	London College of Printing	20 January 1965
“ The Virtues of Paint as and Exterior Decorative Material ”	Mr. W. O. Nutt	Brixton School of Building	1 April 1965

Attendance by students of the various Colleges was encouraging and the not inconsiderable effort which had to be expended in arranging and running these lectures was obviously appreciated.

Social and other activities

Annual General Meeting

The Annual General Meeting Dinner at the Criterion-in-Piccadilly on 23 April 1964 was attended by 54 members. The speaker on this occasion was Mr. O. M. H. Jackson, manager, PR and Publicity Department, Shell Chemical Company Limited, who gave an entertaining talk entitled “ Public Relations—does it exist ? ” which stimulated a lively discussion and provided a fitting conclusion to the proceedings.

Ladies' night

The total number of members and guests attending the Ladies' Night at the Criterion-in-Piccadilly on Friday 20 November 1964 was 286. A slightly new slant was given to the occasion by having an Italian style dinner and a more intimate atmosphere was engendered by doing without the main lights and having candles on each table.

After dinner George Fierstone provided music for dancing which continued until 1 a.m., and altogether the occasion was much enjoyed by all those present.

The Guest of Honour, Dr. V. G. W. Harrison, accompanied by Mrs. Harrison, proposed the toast of The London Section. Amongst the other principal guests were the President, Dr. J. E. Arnold and Mrs. Arnold ; Dr. S. H. Bell, President Designate, and Miss P. Grosvenor ; Mr. A. T. S. Rudram, Hon. Research and Development Officer, and Mrs. Rudram ; Dr. D. Atherton, Chairman of the Scottish Section, and Mrs. Atherton ; Mr. C. A. Carey, Chairman of the Southern Branch, and Mrs. Carey ; Mr. W. J. Arnot, Chairman of the Thames Valley Branch, and Mrs. Arnot ; and Mr. R. H. Hamblin, Association General Secretary, and Mrs. Hamblin. The Chairman of the Section, Mr. M. R. Mills, who was accompanied by Mrs. Mills replied to the toast of The London Section and welcomed the guests and ladies, and Mrs. Carey ably responded on their behalf.

Summer visits

A visit to Shell Centre was arranged for Wednesday 1 July, but the response was so great that an additional visit had to be arranged and altogether over 300 people attended this function. First of all guests were shown two films “ Traffic in Towns ” and “ Giuseppina ” and this was followed by a short tour of the building and finally a buffet supper on the 23rd floor with visits to the Viewing Gallery. The occasion was very much enjoyed by all members and, at the conclusion, Mr. Mills proposed a vote of thanks to Shell Chemical Company on behalf of those present, expressing the hope that visits of a similar nature might be arranged for future years.

Obituary

The Committee wish to record their sorrow at the death of one of the outstanding members of the Section, Dr. L. A. Jordan, who was an Honorary Member of the Association and a Past President. Louis Jordan was a great personality and a good friend and he will be greatly missed by many.

Acknowledgments

Members of the Committee wish to express their thanks to Mr. Nutt, Mr. Whitaker and Mr. Davidson for all the valuable help which they have rendered during their service on the Committee. They also wish to thank Mr. Hamblin and his staff for their ready assistance in all matters.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS							
1963		1964		1963		1964					
£	s.	d.	£	s.	d.	£	s.	d.			
<i>Meetings :</i>				<i>Balance</i>							
70	15	6	47	2	0	111	13	6			
36	18	5	45	6	2	640	0	0			
9	5	0				38	0	0			
77	8	2	50	18	2	590	2	0			
Annual General Meeting Expenses—Hotel ..				Grants from Council							
58	14	3	72	11	0						
<i>Ladies' Night</i>				AGM Supper							
444	2	7	443	11	8						
78	0	9	88	13	9						
65	10	4	64	0	6						
<i>General Expenses</i>				Ladies' Night							
145	12	11	150	10	0						
110	12	2	101	15	2						
1	9	4	1	9	6						
65	11	3	47	10	5						
40	0	0	80	0	0						
40	0	0	80	0	0						
135	14	10	72	6	6						
<i>Printing and Stationery</i>				<i>Bank Charges</i>							
<i>Postage and Telephone</i>				<i>Entertainment of Lecturers</i>							
<i>Bank Charges</i>				<i>Southern Branch</i>							
<i>Entertainment of Lecturers</i>				<i>Thames Valley Branch</i>							
<i>Southern Branch</i>				<i>Balance</i>							
<i>Thames Valley Branch</i>											
<i>Balance</i>											
<hr/>				<hr/>							
£1,379		15 6		£1,345		14 10		£1,379 15 6		£1,345 14 10	

Creditors as at 31 December 1964. Nil.

Approved,

W. H. CAMPBELL
Hon. Auditor.

Debtors as at 31 December 1964. Nil.

Bankers : Barclays Bank Limited, 1 Waterhouse Lane, Kingswood, Surrey.

J. E. POOLEY
Hon. Treasurer.

Southern Branch**Honorary Officers and Committee**

The following Honorary Officers and Committee Members were elected at the fourth Annual General Meeting on Monday 13 April 1964.

Chairman	Mr. C. A. Carey	(4)
Hon. Secretary and Branch representative on London Section Committee	Mr. P. Targett	(4)
Hon. Treasurer	Mr. R. D. D. Orwin	(3)
Hon. Publications Officer	Mr. A. F. Routley	(4)
Hon. Auditor	Mr. L. Clark	

Committee :

Mr. F. W. Davies (Immediate Past Chairman) (3), Mr. R. A. Brown (4), Mr. D. Hardwicke (3), Mr. J. C. Kingcome (3), Mr. W. H. Morris (5), Mr. W. R. Weaver (3).

Mr. R. D. D. Orwin resigned from the office of Hon. Treasurer on leaving the district at the end of 1964. Mr. W. H. Morris agreed to act as Hon. Treasurer until the Annual General Meeting.

Five Committee meetings were held during the session, individual attendances of members being indicated in brackets above.

Membership

The membership of the Branch on 31 December 1964, and the corresponding figures for 1963, was :

					1964	1963
Honorary	..	..	..	..	1	1
Ordinary	..	..	..	..	32	28
Associate	..	..	..	..	6	9
Junior	..	..	..	..	1	1
					—	—
					40	39
					—	—

Meetings

The following meetings were held during the session, the average attendance being 25 members and visitors.

1964

21 September : " Marine Coatings—Some Impressions from a Visit to USA," by Mr. J. C. Kingcome at Southsea.

12 October : " Pigmentation of Finishes for Electrodeposition," by Mr. J. R. Taylor at Southampton.

9 November : " Durability Testing of Titanium Oxide Pigments," by Mr. E. Oakley at Southsea.

14 December : " Fluorescent Pigments and Coatings," by Mr. H. H. Lavell at Southampton.

1965

11 January : " Possibilities with Emulsions in the Paint Field," by Dr. P. M. Troll at Southsea.

8 February : " Some Applications of Marine Paints," by Dr. T. A. Banfield at Southampton.

8 March : " The Scientific Examination of Paintings and Antiquities," by Dr. A. E. Werner at Southsea.

Publication

"Variations on Urethane Oils," a paper given by Mr. A. C. Jolly to the Branch during the 1963-64 session has been published in the December 1964 issue of *JOCCA*.

Appreciation

It was with great regret that the Committee received Mr. R. D. D. Orwin's resignation from the office of Hon. Treasurer. Mr. Orwin has been one of the most active and enthusiastic members of the Branch since its inception and he will be very much missed.

Financial Statements for the Year ended 21 December 1964.

FINANCIAL STATEMENT 1964

1963			1964			1963			1964			
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	
PAYMENTS						RECEIPTS						
						39	15	1				
						40	0	0	Balance brought forward	23	3	4
									Grants from London Section	80	0	0
									Social Functions :			
42	18	6			0	16	16	6	Receipts from sale of tickets	13	6	0
19	5	7			0	11	0	0	Cash and allowances for			
4	13	8			0				Cheque Book			
7	1	6			5							
23	3	4			11							
—	—	—			—							
£97	2	7			4	£97	2	7				
			£116	9	4				£116	9	4	

Creditors as at 31 December 1964. £9 11 11.

Audited and found correct

L. CLARK
Hon. Auditor.

Debtors as at 31 December 1964. Nil.

R. D. ORWIN
Hon. Treasurer.

Thames Valley Branch

At the Annual General Meeting, held at the Royal White Hart, Beaconsfield, Bucks., on Tuesday 7 April 1964, the following Honorary Officers and Committee were elected.

Honorary Officers and Committee

Chairman and representative on London Section Committee	Mr. W. J. Arnot	(7)
Hon. Secretary	Mr. J. D. Lewis	(7)
Hon. Treasurer	Mr. P. Walker	(4)
Hon. Publications Officer	Mr. W. Simpson	(7)
Hon. Auditor	Mr. A. A. Drummond	

Committee :

Mr. K. R. W. Chitty (5), Mr. R. E. Gunn (6), Mr. A. G. Holt (6), Mr. B. K. Hood (6), Mr. L. L. Pearson (5), Mr. W. H. Tatton (2).

Seven Committee Meetings were held, individual attendances being given in brackets.

Membership

Membership of the Branch on 31 December 1964 and the corresponding figures for 1963 :

					1964	1963
Ordinary	..	..	..	..	110	98
Associate	..	..	..	..	16	9
Junior	..	..	..	..	7	3
					<hr/>	<hr/>
					133	110

Meetings

1964

24 September : "Electrodeposition of Paints," by Dr. A. L. L. Palluel.

15 October : "Objective Approaches to Colour Matching and Production Control," by Mr. J. L. R. Landry.

17 November : "Antimony Oxide in Flame Retardant Paints," by Mr. A. G. Walker.

8 December : "Management Techniques in Research," by Mr. S. P. Rose.

1965

14 January : "Design of Experiment," by Mr. A. R. H. Tawn.

16 February : "The permeability of Paint Films to Water," by Dr. R. W. Wilson.

16 March : "Furoic Acids in Alkyds," by Mr. V. F. Jenkins.

All meetings were held at the Royal White Hart, Beaconsfield, Bucks. and were well attended.

Social activities

Following the first Annual General Meeting, at the Royal White Hart, a film evening was held, at which the films "A Light in Nature" and "The Heroic Days" were seen. Both films were interesting and entertaining.

A Buffet dance was held on Friday 5 February 1965 at the Riviera Hotel, Maidenhead, Berks., and was attended by 137 members and their friends. Dancing to Grant Stevens and his Music continued until 1 a.m. with intervals for Buffet Supper and two cabaret items. The evening was much enjoyed by all. Thanks are due to Mr. Simpson, Mr. Chitty and Mr. Holt, for their work in organising the function.

Acknowledgments

The members of the Committee place on record their thanks to Mr. Pearson and Mr. Tatton, the two retiring committee members, for their work during the session. Thanks are also due to ICI Limited, Paints Division, for the regular use of a committee room.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS			
1963		1964		1963		1964	
£	s. d.	£	s. d.	—	—	—	—
				40	0	0	
13	5	6	55	7	6	23	4
—	—	—	—	—	—	80	0
1	0	3	4	6	6	—	—
2	10	0	16	7	0	—	—
23	4	3	27	3	3	—	—
—	—	—	—	—	—	—	—
£40	0	0	£103	4	3	£40	0

Creditors as at 31 December 1964. Nil.
Audited and found correct

A. A. DRUMMOND
Hon. Auditor.

Bankers: Midland Bank Limited, PO Box 15,
28 Broad Street, Reading.

P. WALKER
Hon. Treasurer.

Manchester

Honorary Officers and Committee

At the 40th Annual General Meeting held on Friday 17 April 1964, the following Officers and Committee were elected:

Chairman	Mr. H. F. Clay
Vice-Chairman	Mr. I. S. Moll
Hon. Secretary	Mr. H. G. Clayton
Hon. Treasurer	Mr. S. Duckworth
Hon. Publications Secretary	Mr. W. F. McDonnell
Hon. Research Liaison Officer	Dr. F. M. Smith
Hon. Programmes Officer	Mr. K. W. G. Butcher
Hon. Social Secretary	Mr. M. J. Heavers
Hon. Auditors	Mr. L. Bowden
	Mr. F. A. Walker

Committee:

Mr. J. F. J. Rule, Dr. D. A. Plant, Mr. C. Williams, Mr. T. Graham, Mr. J. J. Kavanagh, Dr. G. A. Wolstenholme.

The Committee appointment for the Representative on Council was Mr. M. J. Heavers.

During the year there were six Committee Meetings.

Membership

	1963	1964
Honorary	1	2
Ordinary	331	337
Associate	70	71
Junior	14	23
	416	433

Members of the Section will have read about Mr. G. A. Campbell's appointment as an Honorary Member. The Committee would like to take this opportunity of recording its pleasure at the 100 per cent increase in the number of Honorary Members which this appointment has brought about and of congratulating Mr. Campbell.

In 1964 membership rose to a record level, helped by a substantial rise in the number of Junior Members. This improvement in the Junior membership is particularly gratifying and encourages the Committee to continue to provide Junior activities.

During 1964 there have been 20 resignations, ten transfers from the Section and 15 transfers to the Section, and 21 new members. In addition 16 new members have been approved since the beginning of 1965 as against nine resignations.

Meetings

The following programme of Section Meetings was held during this session and we would like to record our thanks to all those who presented papers.

1964

9 October : "The Electrodeposition of Paint," by Mr. G. North.

20 November : "Dispersion Stabilisation Mechanisms in Paint Systems," by Mr. W. Black.

11 December : "Cybernetics," by Dr. M. J. Apter.

1965

22 January : "New Organic Pigments," by Dr. A. Pugin.

19 February : "Technological Education and the Paint Industry," by Prof. R. H. Peters and Dr. H. W. Keenan.

12 March : "New Developments in the Field of Polyurethane Lacquers," by Dr. Mennicken.

The average recorded attendance was 83. This is a small increase on last year, but the Committee are not happy that our attendance book is not signed by all present and we take this opportunity of asking members to ensure that they make an effort to record their attendances in the book at meetings.

Junior activities

A very successful Junior Meeting was held in Manchester on 4 September. Following a buffet tea, Dr. Jolly read a paper entitled "Highlights of Progress in Paint Technology," which attracted a high attendance, 60 people being present.

A second Junior Lecture is arranged for 2 April, when Mr. H. G. Cook will read a paper on "The Principles and Techniques of Pigment Dispersion."

As a result of the greater response to our Junior activities and the increase in Junior membership, the Committee intend to continue their efforts in this field and it is hoped to arrange a meeting in Liverpool at the beginning of the next session.

Works visits

Two works visits were arranged to the Ford Motor Company, Halewood. In all, over 80 members attended these visits. Special arrangements were made by Fords to include the paint shop in these visits and the Committee would like to record their appreciation of the efforts made by the Public Relations Department of Fords to make these visits a success.

A further works visit was made to ICI Dyestuffs Division, Blackley, on 3 July 1964, when 25 members spent the day visiting the laboratories and experimental plant. The Committee would like to thank the chief colourist, Mr. North, and members of his staff for the arrangement of this visit and the enjoyable lunch which was provided for members.

Research and development

The Research and Development Committee, consisting of Mr. T. Graham, Mr. T. E. Johnson and Mr. H. R. Touchin, with Dr. F. M. Smith, have co-opted Mr. W. F. McDonnell.

Meetings have been held to discuss the new project, "The Reliability of Subjective Assessment," and a pilot scheme is being worked out on one assessment. The property chosen for this is brushability and the assessments of six operators to a number of paints will be studied. Later on a much wider project will be considered. The possibility of undertaking assessments of colour in connection with the Hull Section or the PRS is being considered.

Preliminary details are also being worked out for a symposium projected for 1966.

Social events

- (a) Hot pot supper after the Annual General Meeting on 17 April 1964.
- (b) The first Ford's works visit on 18 September was followed by a dinner at the Gateacre Hall Hotel. The second visit on 26 November was followed by a lunch at the Derby Arms, Halewood.
- (c) The Annual Dinner-Dance was held on 23 October at the Midland Hotel, Manchester. The principal guest was Mr. W. N. Gilbert-Harris (Deputy Managing Director of the Donald Macpherson Group of Companies). Other guests were Mr. and Mrs. J. G. N. Smith (Chairman of the Newcastle Section), Mr. and Mrs. R. D. Calvert (Chairman of the Midland Section) and Mr. R. H. Hamblin (Association General Secretary). There was a large attendance of approximately 370 members and guests.

Publications

The following papers read to the Section were published :

- (a) " Polyamide-Epoxy Blends : A Corrosion Inhibiting Vehicle for Paints," by Dr. H. Wittcoff.
- (b) " Extrusion Coating and Polyolefines," by Mr. C. D. Wells.
- (c) " Pvc Metal Coatings," by Mr. M. R. Day.
- (d) " The Factory Application of Dip Coatings," by Mr. E. W. Foley.
- (e) " The Versatility of Techniques Available for Applying Epoxy Powders," by Dr. K. W. Humphreys.
- (f) " Modern Dispersion Equipment—High Speed Mixing Equipment," by Mr. G. R. Lester.
- (g) " The Szegvari Attritor," by Mr. H. Wadham.
- (h) " The Sand Grinding Process," by Mr. W. B. Callahan and Mr. W. Manz.
- (i) " The Versatility of Chromatographic Techniques in their Application to Paint Research," by Mrs. S. M. Rybicka.
- (j) " The Laboratory Evaluation of the Behaviour of Coloured Pigments on Ball-Milling," by Mr. H. G. Cook.
- (k) " The Progress of Water Soluble Resins in Industrial Finishing," by Mr. L. Tasker and Mr. J. R. Taylor.

This is a formidable list and the Committee feel they should particularly thank Mr. I. S. Moll and his successor as Publications Secretary, Mr. W. F. McDonnell, for the work which has gone into this notable achievement.

Retiring Committee Members

In accordance with Rule No. 8, Mr. J. F. J. Rule retires from the Committee this year. The Committee would like to record their thanks for his advice and services to the Section whilst he has served as a Committee Member.

The Committee would also like to record their thanks to Mr. K. W. G. Butcher, who for personal reasons asks not to be considered for re-election to the position of Hon. Programmes Officer. Mr. Butcher has set a very high standard in his execution of these duties, which were previously undertaken by the Hon. Secretary. His success is apparent in the excellent attendances at our meetings in the last two years.

Acknowledgments

The Committee wish to express their thanks to :

- (a) The Ford Motor Company for the arrangement of the two works visits.
- (b) The Geigy Co. Ltd. for the use of their board room for four Committee Meetings during the year.
- (c) Imperial Chemical Industries, Dyestuffs Division, for the arrangement of a works visit.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS			
1963		1964		1963		1964	
	<i>Meetings :</i>				Balance brought forward	..	93 0 6
	Hire of rooms, refreshments,			350 0 0	Grants from Council	..	150 0 0
127 3 2	reporting, hire of projector,				<i>Social Functions :</i>		
	etc.	74 5 0		706 2 0	Receipts from sale of tickets	872 7 6	
	<i>Social Functions :</i>				<i>Symposium :</i>		
738 14 10	Band, Guests, etc.	918 12 0		34 5 0	Sale of Tickets	..	..
	<i>General Expenses :</i>			— — —	Subscriptions	..	3 3 0
	Printing and stationery, tele-						
	phone, bank charges,						
95 13 10	postage and sundries	..	29 16 6				
	<i>Entertainment :</i>						
24 0 3	Lecturers	..	14 0 6				
92 6 8	Balance as per Cash Book	..	69 9 2				
11 14 5	Bank Overdraft	..	..		
13 10	Cash in hand	..	12 7 10				
<u>£1,090 7 0</u>		<u>£1,118 11 0</u>		<u>£1,090 7 0</u>		<u>£1,118 11 0</u>	

Audited and found correct,

L. BOWDEN, F. A. WALKER
Hon. Auditors

Bankers : Lloyds Bank Limited, Darwen, Lancs.

S. DUCKWORTH.
Hon. Treasurer.

Midlands

Honorary Officers and Committee

Chairman	.. .. .	R. D. Calvert	(6)
Immediate Past Chairman	.. .. .	A. R. G. Warne	(4)
Hon. Secretary and Representative on Council	.. .. .	D. J. Silsby	(6)
Hon. Treasurer	.. .. .	D. J. Morris	(4)
Hon. Publications Secretary	.. .. .	L. R. Seaborne	(6)

Committee

H. J. Griffiths (3), R. E. Howse (4), L. V. Jennings (2), D. Meadows-Jones (3), C. H. Morris (3), G. H. Morris (1).

The Committee has met on six occasions ; attendances are given in parentheses after the names.

Membership

The figures for membership of the Section at 31 December were as follows :

	1963	1964
Honorary	2 (0)	2 (0)
Ordinary	172 (25)	185 (34)
Associate	39 (10)	39 (10)
Junior	9 (1)	18 (8)
	<u>222</u>	<u>244</u>

Figures in parentheses indicate members attached to the Trent Valley Branch.

Programme

1964

18 September : "The Selection and Efficient Operation of Shot Blasting Equipment," by Mr. W. R. Macmillan. Held at Griffiths Bros. & Co. London Ltd., Wednesfield (33).

15 October : "Electrodeposition of Paint," Day Symposium. Held at the Regency Club, Shirley (155).

20 November : "What is a Pigment Dispersion ?" by Dr. F. M. Smith (56).

1965

15 January : " Raw Material Trends," by Mr. A. Mott (33).

19 February : " Powder Coatings," by Mr. C. H. Morris (65).

19 March : The Newton-Friend Lecture, " The Ulterior Appearance of Buildings (Some Effects of Weathering and Air Pollution)," by Mr. R. B. White (30).

Social events

A dinner was held after the Annual General Meeting in 1964 to which members' ladies were invited.

Members were invited to participate in a golf tournament arranged by the Birmingham Paint, Varnish and Lacquer Club, which was held on 6 June 1964.

The Annual Ladies' Evening was again held at the Belfry Hotel on 4 December. Approximately 210 people attended and a very successful evening resulted.

Acknowledgments

The Committee circulated to all members the result of the census of opinion on which evening of the week the technical meetings should be held.

The Committee wishes to record its thanks to the speakers who have contributed to the success of the programme.

The Committee wishes to record its thanks to the Board of Griffiths Bros. & Co. London Ltd. for their kindness in allowing us to use Armour Hall, Well Lane, Wednesfield, for the meeting held on 18 September 1964 and for providing tea beforehand.

The Committee wishes to record its appreciation of the services rendered by the members retiring under Rule 8, Mr. D. Meadows-Jones and Mr. C. H. Morris.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS			
1963		1964		1963		1964	
<i>Meetings :</i>							
28	11	6	Hire of rooms	30	10	6	
34	13	9	Projector	22	8	6	
22	3	0	Refreshments	16	18	0	
—	—	—	Symposium	236	6	0	
<i>Social Functions :</i>							
53	16	4	AGM Dinner	43	5	6	
476	9	11	Ladies' Evening	464	4	9	
—	—	—	Ladies' Evening 1963	22	13	0	
47	18	3	Ladies' Evening 1962	—	—	—	
<i>General Expenses :</i>							
22	12	2	Printing and Stationery	4	12	1	
—	—	—	Post and Telephone	—	8	9	
1	5	0	Bank Charges	1	5	0	
10	0	0	Cheque Book	10	0	0	
40	0	0	Trent Valley Branch	—	—	—	
<i>Entertainment :</i>							
25	4	0	Lecturers	9	5	11	
10	14	6	Trent Valley Dinner	—	—	—	
—	—	—	Sundries	1	16	0	
15	6	8	Balance as per Cash Book	49	8	8	
—	—	—	Cash in Hand	—	—	—	
£779	5	1		£903	12	8	
Audited and found correct				Bankers : Midland Bank Limited, New Street, Birmingham, 2.			
N. A. BENNETT				D. J. MORRIS			
F. COOPER				Hon. Treasurer.			
Hon. Auditors.							

Trent Valley Branch**Honorary Officers and Committee**

At the first Annual General Meeting of the Branch, held on 6 April 1964, the following Officers were elected :

Chairman	Mr. F. G. Dunkley
Hon. Secretary	Mr. G. E. Franklyn-Smith
Hon. Treasurer	Mr. G. T. Tibbs
Hon. Publications Officer	Mr. A. Robinson

Committee :

Mr. C. W. Collier, Mr. H. J. Foot, Mr. Wm. C. Hall, Mr. S. N. Hawley, Mr. R. S. Law, Mr. J. L. Partington.

The Committee has met on six occasions.

Membership

The membership at 31 December 1964 and the corresponding figures for 1963 were :

					1964	1963
Ordinary	..	..	..	..	34	25
Associate	..	..	..	..	10	10
Junior	..	..	..	..	8	1
					<hr/>	<hr/>
					52	36
					<hr/>	<hr/>

Meetings**1964**

1 October : "Current Developments in Dispersion," by Mr. G. Cope (21).

12 November : "Colour Consciousness," by Dr. F. M. Smith (35).

1965

14 January : Joint Meeting with members of the Derby Branch of the National Federation of Master Painters and Decorators of England and Wales (40).

25 February : "Pigmentation of Finishes for Electrodeposition," by Mr. L. Tasker and Mr. J. R. Taylor (33).

Junior activities*Sub-Committee :*

Mr. F. G. Dunkley, Mr. C. W. Collier, Mr. H. J. Foot.

A questionnaire was sent to 57 companies and undertakings in the area covered by the Branch. The response was sufficiently promising to warrant organising special meetings for junior technologists.

Social events*Sub-Committee :*

Mr. S. N. Hawley, Mr. J. L. Partington, Mr. S. H. Sims.

The above Sub-Committee was formed in January and a programme of social events is being arranged for the coming session.

Works visit

On 7 May a party of members visited the emulsion polymerisation plant and tyre factory at Fort Dunlop. The Committee wish to express their appreciation to Dunlop Rubber Company Ltd. for their hospitality.

Acknowledgments

The Committee gratefully acknowledge the valuable help given by the following Officers and members who have left the district : Mr. Wm. C. Hall (Committee Member), Mr. G. T. Tibbs (Hon. Treasurer) and Mr. A. Robinson (Hon. Publications Secretary).

(During the year Mr. G. T. Tibbs has been succeeded as Hon. Treasurer by Mr. D. W. Guest, and Mr. A. Robinson as Hon. Publications Secretary by Mr. J. L. Partington.)

Members of the Committee wish to acknowledge the support given by Officers of the Midlands Section, and the assistance so freely given by Mr. R. H. Hamblin and his staff.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS											
1963			1964	1963			1964								
1	1	0	Meetings	19	2	6	—	—	—	Balance brought forward ..	38	4	0		
—	—	—	Social Functions	8	10	0	40	0	0	Grants from Council	—	—	—		
—	15	0	General Expenses	2	5	10	—	—	—	Sale of refreshments at meetings ..	4	12	0		
37	14	0	Balance as per Cash Book ..	18	19	0	—	—	—	Social Functions	—	7	0		
10	0	0	Cash in hand	18	8										
<hr/>				<hr/>				<hr/>				<hr/>			
£40 0 0				£49 16 0				£40 0 0				£49 16 0			

Creditors as at 31 December 1964. £8 7 6.

Audited and found to be correct:

E. HARE
K. BUCKLEY
Hon. Auditors.

Bankers: Midland Bank Limited, King Street,
Belper, Derbyshire.

D. W. GUEST
Hon. Treasurer.

Newcastle

Honorary Officers and Committee

At the Annual General Meeting held on 9 April 1964 the following Officers were elected:

Chairman	Mr. J. G. N. Smith
Vice-Chairman	Mr. E. L. Farrow
Secretary	Mr. J. A. Willey
Treasurer	Mr. A. W. Blenkinsop
Publications Officer	Mr. D. M. James
Research Liaison Officer	Mr. T. A. Banfield
Co-ordinating Officer for Technical Education	Mr. E. L. Farrow
Representative on Council	Mr. H. D. Jefferies
Secretary Junior Activities Sub-Committee	Mr. K. F. Baxter

Four vacancies on the Committee were filled after a ballot, and the following elected members served the Section during the past year:

Committee:

Mr. N. J. P. Buchanan, Mr. P. C. Edbrooke, Mr. K. V. Hodgson, Mr. F. G. Palmer, Mr. P. M. Proudley, Mr. D. C. Wall.

The Hon. Auditors were Mr. R. Gill and Mr. T. W. Robinson.

Membership

Our total membership at 31 December 1964 is given below and compared with the corresponding figures for the previous year:

	1964	1963
Ordinary	147	154
Associate	22	24
Junior	12	6
	<hr/>	<hr/>
	181	184

In spite of the apparent stability of these figures, the past year has seen some quite drastic changes. Eleven new Ordinary Members were enrolled to replace the eleven who resigned, but whilst a similar number transferred out to other Sections, we only had three who came in by transfer. A Junior Member was upgraded, seven new Juniors recruited and transfers reduced the Section's Associates by two.

Meetings

Six Ordinary Meetings were held during the session with an average attendance of 57.

1964

1 October: "Paint and the Consumer," by Mr. J. Dukes (82).

12 November: "Industrial Finishes in the Appliance Field," by Dr. H. J. Sharp (41).

3 December: "The Formulation and Testing of Paints for Use in Radioactive Areas," by Mr. P. Walker (37).

1965

7 January : "Recent Developments in Thermosetting Acrylic Resins," by Mr. P. V. Robinson and Mr. K. Winter (65).

4 February : "Some Marine Coating Problems," by Mr. J. C. Kingcome (82).

4 March : "Developments in Vehicles for Printing Inks," by Mr. G. H. Hutchinson (35).

The first meeting in October was held jointly with the local branches of the Federation of Master Painters and Decorators and the Paintmakers Association.

Junior activities

The Sub-Committee elected at the Annual General Meeting comprised the following gentlemen :

Chairman	Mr. J. G. N. Smith
Secretary	Mr. K. F. Baxter
Co-ordinating Officer for Technical Education	Mr. E. L. Farrow
Elected Members	Mr. H. H. L. Drew, Mr. H. Fuller, Mr. B. Ridley

Only one lecture was held when Mr. Hanson spoke about "Corrosion in the Marine Industry."

Attention is being given to means of increasing Junior membership, and replies to a questionnaire indicated that a further 60 was a possibility. It is hoped that the time which has been spent on organisational ground work will lead to a successful session next year.

FINANCIAL STATEMENT 1964

1963			1964			1963			1964		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
PAYMENTS						RECEIPTS					
<i>Meetings :</i>						<i>Balance brought forward :</i>					
35	3	0	30	9	0	78	9	11	66	7	8
5	14	5	—	—	—	2	12	3	2	0	0
<i>Social Functions :</i>						<i>Social Functions</i>					
24	15	0	22	11	3	24	15	0	22	10	0
142	6	3	40	4	4	142	10	0	90	6	0
<i>General Expenses :</i>						<i>Grant</i>					
6	16	0	17	16	7	—	—	—	100	0	0
12	6	—	7	6	—	<i>Unused Cheques</i>					
—	—	—	5	0	—	2 4					
12	3	—	2	16	3						
4	2	11	1	16	3						
47	0	0	—	—	—						
4	0	0	—	—	—						
<i>Entertainment :</i>											
55	2	9	29	8	7						
33	1	11	—	—	—						
37	12	6	43	13	9						
66	7	8	39	17	6						
2	0	0	2	0	0						
£465	7	2	£281	6	0	£465	7	2	£281	6	0

Creditors at 31 December 1964. £12.

Audited and found correct

R. GILL
T. W. ROBINSON
Hon. Auditors.

Bankers : Lloyds Bank Limited, 27 High Street,
Stockton-on-Tees, Co. Durham.

A. W. BLENKINSOP
Hon. Treasurer.

Social activities

The Annual General Meeting in 1964 was followed by a wine tasting, at which a local wine merchant talked about and illustrated a selection of table wines.

Ladies' Night was held in Newcastle on 26 March, the County Hotel being the venue. Principal guests were Mr. and Mrs. Calvert and Mr. and Mrs. Clay from Birmingham and Manchester respectively, Dr. and Mrs. Atherton from Glasgow, Mr. and Mrs. Connor (Master Painters) and Mr. and Mrs. Jenkins. The Chairman presented Mr. Jenkins with a battery-driven

During 1964 Committee reported with deepest regret the deaths of three members: Mr. R. K. Abrams, Mr. A. L. Brown, Mr. B. O'Malley-Jones. All were Ordinary members. Messages of sympathy were sent to the relatives on behalf of members.

Meetings

Committee Meetings

Meetings of the Committee were held at Science House, Sydney. During the first half of the year meetings were held on the third Thursday, and during the latter half of the year generally on the second Thursday.

Twelve meetings were held during the session, and individual attendances of the Committee Members were as follows: Mr. J. H. Foxton (12), Mr. B. Lathlean (11), Mr. B. J. Lourey (11), Mr. L. Jones (10), Mr. B. T. Clarke (10), Mr. P. J. Donovan (9), Mr. D. R. Heywood (9), Mr. M. J. Leahey (9), Mr. J. V. McAuliffe (2), Mr. D. M. Martin (9).

Ordinary Meetings

Monthly Ordinary meetings were held on the second Thursday of each month during the first half of the year. From August, meetings were changed to the third Thursday to enable timely publication of the meeting notices in the *Australian OCCA Proceedings and News*.

General Meetings

Two Special Meetings were called to consider alterations to certain of the NSW Section Rules. Following the suggestions of the 1963 Rules Sub-Committee, Rules 5, 6, 7, 8, 12 and 31 were selected as warranting consideration. The rules amendments as presented by the Sub-Committee were discussed and accepted by the Section Members with minor modifications. The amendments were subsequently ratified by Council for inclusion in the Rules of the New South Wales Section.

Details of the 1964 meetings are as follow, attendances being shown in parentheses:

13 February: General Meeting—Rules amendments (59).

13 February: Seventeenth Annual General Meeting (59).

12 March: "Australian Economy in 1964," by Mr. H. D. Black (72).

9 April: "What Can the Paint Industry Provide?" "Architects and Engineers State Their Case."
A conjoint meeting with the Australian Institution of Engineers and the Royal Australian Institute of Architects (66).

14 May: "Isotopes—Uses as Physical and Chemical Tracers," by Dr. J. H. Green (51).

11 June: "The Helium-Neon Laser," by Dr. J. V. Ramsay (33).

9 July: An inspection of operating computers at the offices of ICT (47).

20 August: "Paint—Adhesion and Corrosion Resistance," by Mr. K. Woods (60).

17 September: "Management Sciences and Decision Making," by Mr. K. Stewart (52).

15 October: "Pigments in Printing Inks," by Mr. A. R. Barlee (45).

19 November: "Modern Extenders for Paint," by Mr. W. Murphy (40).

Social functions

Pre-Meeting Dinners: These were held in the BP Dining Room, MLC Building, Miller Street, North Sydney, and were again well attended by members. The lecturer for each meeting was entertained as a guest of the Section.

Annual Ball: The Ball was held at "The Amory," Ashfield, on Friday 3 July, and was considered by all to have been a success, due no doubt to the capable efforts of Mr. L. Richardson as Master of Ceremonies.

Golf Day: A large gathering of members and guests enjoyed a fine day golfing at Pennant Hills Golf Club on Tuesday 8 September.

This year saw the first presentation of the O'Malley-Jones Memorial Trophy awarded in memory of the late Bernard O'Malley-Jones, always a popular and respected member.

Ladies' Night: Members, wives and friends were present at "El Rancho," Eastwood, on Wednesday 7 October, for the Annual Ladies' Night. The evening was considered very successful by all attending.

Annual Dinner : This function, held at "The Amory," Ashfield, on Thursday 3 December, again proved to be very popular. The NSW President of the Royal Australian Chemical Institute and the Executive Director of the Australian Paint Manufacturers' Federation were entertained as guests of the Section, and several interstate Section members attended.

General

As in previous years, Past Chairmen of the Section were entertained by the Chairman and Committee at "Jonroe," Ashfield on Wednesday 29 April 1964.

The OCCA scholarship awarded in 1959 to Mr. B. Thompson has been discontinued. Due to unforeseen circumstances Mr. Thompson has experienced many difficulties at the University of New South Wales in bringing his work to a satisfactory stage of development and during the year requested that he be released from the obligations imposed by the scholarship. Committee agreed to his request, and subsequently sought, and was granted, a refund of the money invested in the project. The University returned the sum of £133 and this money is now being held in trust at the Section's bank. It is recommended to the incoming Committee that consideration be given to the granting of the Scholarship at an opportune time.

Forty-six New South Wales Section members attended the Sixth Australian Convention at Warburton, Victoria, from 16-19 July 1964. The success of this Convention supported this Section's view that Conventions should remain an annual event in the OCCA Calendar.

Notices for the October and November meetings were included in the *Australian OCCA Proceedings and News* instead of a separate mailing to members; this method of circularising members was found to be particularly successful.

Acknowledgments

The Section was again represented on Council by Past President, Mr. P. J. Gay. Committee is most appreciative of Mr. Gay's assistance.

Thanks are due to Mr. M. Browne of the Victorian Section, who has acted as New South Wales Section Proxy to the Australian Federal Committee over the past 18 months.

Committee also appreciates the assistance given by Sub-Committee member, Mr. F. Newstead in providing the photographs which he has taken for the OCCA publications over recent years.

The Chairman and Committee also record their appreciation for the co-operation of all members of the Section throughout 1964.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS			
1963		1964		1963		1964	
A£	s. d.	A£	s. d.	A£	s. d.	A£	s. d.
299	16	5	Typing and Printing	277	11	1	
86	10	5	General Expenses				1,166 4 0
			Postage	93	8	4	
93	8	6	Hire of Halls	94	10	0	1,547 7 6
55	10	3	Chairman's Dinner	69	15	2	220 13 6
35	0	0	Lectures	59	16	6	12 10 0
20	18	0	Honoraria	31	10	0	36 7 1
206	12	8	Official Digest	215	15	6	3 0 0
26	4	7	Badges				69 1 3
323	18	1	UK Remittance	1,045	15	3	.. .. .
—	—	—	Miscellaneous	22	2	2	.. .. .
—	—	—	Books	3	18	9	.. .. .
1,166	4	0	Cash in Banks 31/12/'64	1,062	17	10	.. .. .
<hr/>				<hr/>			
A£2,314	2	11		A£2,993	12	1	

Audited and found correct

R. B. LEIGH
A. J. MULLIGAN
Hon. Auditors

Bankers : Commonwealth Trading Bank, Elizabeth Street, Waterloo, New South Wales, Australia.

B. J. LOUREY
Hon. Treasurer.

Queensland

Honorary Officers and Committee

Chairman	Mr. G. Smith
Vice-Chairman	Mr. R. N. Lewis
Hon. Secretary	Mr. J. R. Fannin
Hon. Treasurer	Mr. K. Collins
Hon. Publications Officer	Mr. B. N. Auld
Hon. Social Convenor	Mr. D. G. Jago
Representative on Council	Mr. P. J. Gay
Hon. Auditors	Messrs. C. E. Lever and R. A. Urquhart

Committee :

Mr. E. Baker, Mr. J. C. Anner, Mr. J. Sandilands, Mr. J. Arnott, Mr. I. Curtis.

Delegates to Federal Committee :

Mr. G. Smith, Mr. J. R. Fannin.

Proxy on Federal Committee :

Mr. K. Le Lievre.

Representative on RMI Sub-Committee :

Mr. B. N. Auld.

Meetings

1964

February : Annual General Meeting.

March : " Mass Production Finishing of Motor Vehicles," by Mr. H. Ryder.

April : " The Survival Problems of Underground Telecommunications Plant," by Mr. B. M. Byrne.

May : " Static Electricity in the Chemical Industry," by Mr. J. Cordner.

June : " Epoxy Protective Coatings," by Mr. A. Adomenas.

July : " Convention Report." Messrs. G. Smith and J. R. Fannin, Queensland delegates to AFC Annual General Meeting, Warburton Convention.

August : " Factory Inspection," " Press Etching," Upper Edward Street, Brisbane.

September : " Demonstration Evening." CIG Pty. Ltd., Newstead, Brisbane.

October : " Wine Tasting Evening," Bamboo Room, Upper Edward Street, Brisbane.

November : " Polyurethane—Systems and Applications," by Mr. J. Samios (Henry H. York & Co. Ltd.).

December : " Christmas Party," Carlton Hotel.

Membership

The position at 31 December 1964 was :

	1964	1963
Ordinary	32	28
Associate	32	31
Junior	3	3
	—	—
	67	62
	—	—

Acknowledgments

The Committee records its thanks to speakers, to those industries whose premises were used for inspections and demonstrations during the year, and to the RSL for the meeting room in Anzac House.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS								
1963		1964		1963		1964						
A£	s. d.	A£	s. d.	A£	s. d.	A£	s. d.					
34	13	0	Meetings	25	14	11	Balance brought forward ..	188	1	1		
5	2	3	Social Functions	18	16	0	Grants from AFC	83	14	0		
34	15	8	General Expenses	77	1	8	Social Functions receipts	—	—	—		
85	13	2	Transfers to OCCA London	134	18	1	Subscriptions	245	10	3		
—	—	—	1964 OCCA Convention Expenses	83	14	0	Bank Interest	6	18	9		
188	1	1	Balance c/f	183	19	5						
<hr/>				<hr/>				<hr/>				
A£348	5	2		A£524	4	1	A£348	5	2	A£524	4	1

Audited and found correct

R. A. URQUHART
Hon. Auditor.

Bankers : Bank of New South Wales, Sandgate Road,
Nundah, Brisbane.

K. J. COLLINS
Hon. Treasurer.

Scottish

Honorary Officers and Committee

The officers and committee elected for the session 1964-65 were as follows :

Chairman	Dr. D. Atherton
Vice-Chairman	Mr. J. S. Hutchison
Immediate Past Chairman	Mr. A. S. Fraser
Hon. Secretary	Mr. W. W. Horsburgh
Hon. Treasurer	Mr. T. B. Hannah
Hon. Publications Officer	Mr. A. McLean
Hon. Representative on Council	Mr. H. Gibson
Hon. Research Liaison Officer	Mr. G. H. Hutchinson
Hon. Education Officer	Mr. A. McLean
Hon. Junior Section Liaison Officer	Mr. D. M. Stewart

Committee

Mr. G. Anderson, Mr. A. Mawer, Mr. P. Birrell, Mr. A. MacGuire, Mr. D. Rowley, Mr. W. M. Young.

Membership

The membership on 1 April 1965, compared with that of the previous year, was as follows :

	1965	1964
Ordinary	113	107
Associate	39	40
Juniors	49	26
	<hr/>	<hr/>
	201	173

of this total the Eastern Branch contributed the following :

	1965	1964
Ordinary	32	31
Associate	3	3
Junior	3	4
	<hr/>	<hr/>
	38	38

Meetings

The average attendance at meetings was 24 this session compared with 30 last session and 35 the session before. This question of attendance is having the full attention of the Committee during the forthcoming months. Lectures were given as follows :

1964

8 October : " The Selection and Efficient Operation of Shot Blasting Equipment," by Mr. W. R. MacMillan.

12 November : " The Development of Water Soluble Resins," by Mr. A. G. North.

10 December : " The Function of the Stock Exchange in Everyday Life," by Mr. A. O. Speirs.

1965

14 January : " A General Review of Driers," by Mr. G. W. H. Turner and Mr. A. T. Royal.

11 February : " Zinc Dust and Flake Pigments," by Mr. D. A. Atkinson.

11 March : " Printing and Metal Decoration," by Mr. A. D. Lott.

During the session 1964-65, nine events of all kinds have taken place and all of these, with one exception, have been fully reported in the *Journal* of the Association and in other trade publications. Of the six lectures delivered to the Section, two merited submission for publication ; but, to date, it has not been possible to obtain the manuscripts from the authors.

So far as the nature of the meetings permitted, all activities of the Junior Section have also been reported in the *Journal*.

Junior Activities : In January 1965 Mr. D. M. Stewart intimated that he was unable, due to business commitments, to continue as Junior Section Liaison Officer.

His resignation was reluctantly accepted by the Chairman of the Scottish Section. Mr. P. Birrell was proposed and appointed as Junior Section Liaison Officer and Chairman of the Junior Section in succession to Mr. D. M. Stewart and took up his duties on 13 February at the AGM of the Junior Section.

At this meeting, following nominations and elections, the following Honorary Officers and Committee were appointed.

Vice-Chairman	Mr. I. R. McCallum
Secretary	Mr. R. F. Hill
Member of Committee	Mr. D. L. Soutar

Mr. M. Devine was co-opted on 13 March 1965 as a member of Committee due to one of the previous members leaving the industry and the Association.

Five formal meetings were held during the session. Four of these were in the form of tutorial sessions which have been so successful in recent years. The fifth meeting was in the form of a Members Discussion Morning following the AGM on 13 February 1965. Subjects ranged widely over paint, printing ink and plastics applications.

The success of these tutorial meetings can again be gauged by the excellent attendance at them, i.e. an average of 23 or *ca* 50 per cent of the Junior Section Membership.

The thanks of the Junior Section are due to the following members of the Senior Section and visitors who assisted in giving the tutorials : Dr. D. Atherton, Mr. I. S. Hutchison, Mr. G. H. Hutchinson, Mr. A. McLean, Mr. A. McGuire, Mr. J. Miller, Mr. W. Maxwell Young and Mr. A. T. S. Rudram of the Paint Research Station.

Two Film shows were also given during the session.

Although free choice of subject was allowed in the Essay competition this year, entries were still more difficult to come by than could have been wished. The competition was won by Mr. F. Hill, with a contribution on " Phthalocyanine Pigments," while the runner-up was Mr. I. R. McCallum, who wrote on " Recent Developments in Surface Coatings."

The first prize was to have been an all-expenses-paid visit to the Association Conference, at Torquay ; but, since this event clashes with Mr. Hill's examination commitments, alternative arrangements are being made. Mr. McCallum will be presented with a set of OCCA " Paint Technology Manuals."

A visit to Edinburgh, including attendance at the Festival Military Tattoo, was made during the summer recess.

In addition to the thanks expressed to Senior Members assisting in the tutorial sessions, thanks are due to Mr. W. Horsburgh and to Mr. A. McLean, Hon. Secretary and Hon. Publications Officer respectively, for their continuing assistance to the Junior Section. A formal vote of thanks was delivered at the AGM on behalf of the Section by Dr. D. Atherton in respect of Mr. Stewart's work for the Junior Section over the last few years.

Social Events

The organisers of social events excelled themselves during the past year when the following items were organised.

- (a) The annual smoking concert at Eaglesham, April 1964.
- (b) A treasure hunt ending with buffet supper at the Fairleyburn Hotel.
- (c) Annual golf outing at Skelmorlie—the Whitaker Trophy being presented at
- (d) the Dinner-Dance jointly to Messrs. D. Chesney and R. Yates.
- (e) A skittles match laid on by the Eastern Branch in June.
- (f) The annual Dinner-Dance in January 1965.

All of these items were greatly enjoyed and the thanks of the Section are due to the organisers of these items.

Works Visits

No works visits were arranged during the session.

Acknowledgments :

The Committee wishes to express their thanks to the retiring members and also to Mr. Hamblin and his staff for their unflinching support and assistance throughout the year.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS																
1963		1964		1963		1964														
£	s.	d.	£	s.	d.	£	s.	d.												
—	—	—	..	..	..	150	0	0											
98	0	2	Balance as at 1/1/64 ..	..	..	Grants from Council ..	150	0	0										
464	12	0	Meetings ..	..	..	12	2	8	Balance brought forward ..	..	..	522	9	9					
7	2	10	Social Functions ..	..	..	475	2	6	Social Functions ..	..	..	13	1	Balance per Cash Book ..	..	..	—	—	—
18	3	3	General Expenses ..	..	..	3	11	9	50	0	0	30	2	3	—	—	—	—	—
50	0	0	Entertainment ..	..	..	9	8	9	—	—	—	—	—	—	—	—	—	—	—
—	—	—	Grant to Eastern Branch ..	..	..	50	0	0	—	—	—	—	—	—	—	—	—	—	—
—	—	—	Balance as per Cash Book ..	..	..	30	2	3	—	—	—	—	—	—	—	—	—	—	—
—	—	—	Cash in hand ..	..	..	—	—	—	—	—	—	—	—	—	—	—	—	—	—
£637	18	3	£672	9	9	£637	18	3	£672	9	9	£637	18	3	£672	9	9	£637	18	3

Audited and found correct

L. HOPWOOD
J. DAVIDSON
Hon. Auditors.

Bankers : National Commercial Bank of Scotland Limited, 22 St. Enoch Square, Glasgow, C.1.

T. B. HANNAH
Hon. Treasurer.

Eastern Branch

Honorary Officers and Committee

The following Honorary Officers and Committee were elected at the first Annual General Meeting held at the North British Hotel, Edinburgh, on 25th March, 1964.

Chairman	Mr. E. A. Bullions	(5)
Vice-Chairman	Mr. P. Holmes	(5)
Hon. Secretary	Mr. G. H. Hutchinson	(5)
Hon. Treasurer	Mr. O. V. Soane	(1)
Hon. Publications Secretary	Mr. P. A. Gower	(5)

Due to the retirement of Dr. J. M. Laverie and Mr. T. Mackay and the election of Mr. P. Holmes to the Vice-Chairmanship there were three vacancies on the Committee. Three nominations were received from members and the following were elected: Mr. R. Harvie, Mr. R. W. Miles and Mr. P. R. Phillips.

Committee

Mr. C. G. Cochrane (5), Mr. R. A. Sim (3), Mr. R. Webster (4), Mr. Harvie (5), Mr. R. W. Miles (5), Mr. P. R. Phillips (5).

Dr. D. Atherton is an *ex officio* member of the Committee. There were five Committee Meetings during the year, individual attendances being shown in parentheses.

Membership

Membership as at 31 December 1964 was as follows :

Ordinary	..	..	..	32
Associate	..	..	..	3
Junior	..	..	..	3
				<hr/>
				38
				<hr/>

Meetings**1964**

25 March : AGM and "Pigment Dispersion," by Dr. S. H. Bell. (22 members, 12 visitors.)

8 April : "Phthalocyanine Pigments—Relation between Physical Form and Performance," by Dr. F. M. Smith and Dr. J. D. Easton. (18 members, 12 visitors.)

14 October : "Work Study" by Mr. J. Gloag. (15 members, 7 visitors.)

11 November : "Paper/Printing Ink Relationships," by Mr. A. T. Franklin. (11 members, 30 visitors.)

9 December : "Driers—1965," by Mr. J. H. W. Turner and Mr. A. T. Royle. (12 members, 3 visitors.)

1965

13 January : "Developments in Water Thinnable Resins," by Mr. J. R. Berry. (15 members, 9 visitors.)

10 February : "Some Aspects of Heating Treatment in the Motor Industry," by Mr. J. Davidson. (15 members, 7 visitors.)

As in the previous year invitations to meetings were sent to technical staffs of local firms engaged in paper, rubber and plastics manufacture, and the response was again encouraging. Attendance of members has been satisfactory, considering the wide area of Eastern Scotland from which our membership is drawn.

Social Activities

A very successful Skittles Outing was held at the Hillburn Roadhouse, Edinburgh, on 27 May 1964 when a Contest was held between 12 Scottish Section members from the West and a similar number from the Branch. The Branch team were winners of an exciting and somewhat hilarious engagement, and it was hoped to arrange a similar event in the coming session.

Works Visits

A Party of 25 members from Scottish Section and Eastern Branch visited the BP Refinery, Grangemouth, on 3 June 1964. A most informative evening was enjoyed by members, and refreshments were provided by the Refinery authorities at the end of the tour.

Acknowledgments

The Officers and Committee wish to express their thanks to the General Secretary, Mr. R. H. Hamblin, to Dr. Atherton, Chairman, Scottish Section, and to Mr. W. W. Horsburgh, Secretary, Scottish Section, for their help throughout the year.

FINANCIAL STATEMENT 1964

1963		PAYMENTS		1964		1963		RECEIPTS		1964		
£	s. d.			£	s. d.	£	s. d.			£	s. d.	
18	4	6	Meetings :	49	3	6	50	0	0	23	7	0
—	—	—	Room hire, projector hire	..	..	16	..	..	..	..	..	..
			Social Functions			3						
			General Expenses :									
2	8	6	Telephone, bank charges,	2	16	4						
			postage	..	..	..			
			Entertainment :									
6	0	0	Lecturers	..	..	14	10	6				
23	7	0	Balance as per Cash Book	..	..	4	5	11				
—	—	—	Cash in hand	..	..	1	14	6				
<hr/>	<hr/>	<hr/>		<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
£50	0	0		£73	7	0	£50	0	0	£73	7	0

Audited and found correct

J. M. LAWRIE
Hon. Auditor.

Bankers : National Commercial Bank of Scotland,
191 High Street, Kirkcaldy.

O. V. SOANE
Hon. Treasurer.

South African

Honorary Officers and Committee

The Annual General Meeting of the South African Section was held on Monday 27 April 1964, at Shell House, Durban, with Mr. G. M. Hamilton in the Chair. The following officers were elected unanimously on the proposal of the outgoing Committee.

Chairman	Mr. F. Schollick
Hon. Secretary	Mr. P. J. Curtis
Hon. Treasurer :	Mr. K. M. Engelbert
Hon. Publications Secretary	Mr. G. E. Whitelaw

Elected Members

Transvaal representatives : Mr. P. Baumann, Mr. K. R. McDonald. *Cape representatives*: Mr. M. F. A. Dawes, Mr. C. E. Simons. *Natal representatives*: Mr. R. S. Everitt, Mr. H. A. J. van der Merwe.

During the year Mr. P. J. Curtis moved to Johannesburg and his place was taken by Mr. H. A. J. van der Merwe. Mr. G. Whitelaw being overseas, Mr. John Turnbull-Smith was co-opted as Hon. Publications Officer in his place.

The outgoing Committee wishes to express its appreciation for the work Mr. P. J. Curtis has carried out for OCCA during the many years he acted as Secretary.

The Section Committee held six meetings during the year.

Membership

The current membership is shown below with the 1963 membership in brackets.

	<i>Cape</i>	<i>Natal</i>	<i>Transvaal</i>	<i>Total</i>
Ordinary ..	25 (25)	55 (49)	71 (69)	151 (143)
Associated ..	11 (7)	21 (24)	13 (11)	35 (42)
Junior	0 (1)	0 (2)	2 (2)	2 (5)
	<u>36 (33)</u>	<u>76 (75)</u>	<u>86 (82)</u>	<u>198 (190)</u>

Meetings

The *Natal Branch* held seven meetings during the past year.

1964

13 April : "Modern Colour Practice," by Miss J. Hoffman.

25 June : "The Pigmentation of Emulsion Paints," by Mr. R. Gutbrod, read by Mr. K. R. McDonald.

31 August : "Chlorinated Rubber in the Surface Coating Industry," by Mr. H. E. Parker.

19 October : "The Laboratory Evaluation of the Behaviour of Colour Pigments in Ball Milling," Mr. I. S. Moll.

16 November : Two films by Messrs. Hoechst SA (Pty) Ltd. (1) Adhesion. (2) Semi-processing of polyethylene.

7 December : "Polymer Characteristics—the Chemical Nature of different types of Polymers," by Mr. K. E. Piggott.

1965

1 March : "The Manufacture of Titanium Dioxide Paints using different types of Paint-making Machinery, with particular reference to the High-speed Impeller Mill," by Mr. G. D. Railton.

The *Transvaal Branch* held five meetings during the past year.

1964

30 April : "The Reactivity of Double Bonds in Polyunsaturated Oil," by Mr. W. G. Hancock and Mr. G. Fisher.

26 August : "Chlorinated Rubber Surface Coatings," by H. E. Parker.

24 September : "The Role of Inhibitive Pigments in Surface Coatings," by Dr. F. P. A. Robinson, Department of Metallurgy, Witwatersrand University.

15 October : "The Laboratory Evaluation of the Behaviour of Colour Pigments in Ball Milling," by I. S. Moll.

12 November : Film : "Thinners on Tap," and a short talk introducing water soluble resins, by Mr. G. Ward.

The Cape Branch : Report not received in time for inclusion.

Branch Reports :

Transvaal : Report not received in time for inclusion.

Cape : Report not received in time for inclusion.

Natal :

Paint Technology Course :

During the year 1964, 13 students were enrolled at the Natal Technical College for the second half of the course, commenced in 1963. A final draft of the proposed course in Paint Technology, leading to a nationally recognised diploma, will be submitted to Technical Colleges involved as well as the Department of Education, Arts and Science in Pretoria ; the Syllabus has been submitted to the other two Branches for their comments. The Committee wishes to thank Mr. K. R. McDonald for lecturing and also his work in drawing up the syllabus.

Acknowledgments

This Section wishes to thank the various private Companies who have sponsored some OCCA meetings throughout the year and Messrs. Buffalo Paints and Lewis and Everitt for the use of their Board Rooms for Section Committee Meetings.

BALANCE SHEET AS AT 31 DECEMBER 1964

1963		1964	1963		1964
R	R	R	R	R	R
	<i>Sundry Creditors :</i>			<i>Investments :</i>	
	Entrance fees paid in advance	7.00		Cash at Grahamstown Building Society :	
504.75	Subscriptions paid in advance	390.60	200.00	On Fixed Deposit ..	200.00
			655.45	In Savings Account ..	259.50
	<i>Accumulated funds :</i>				459.50
	Balance at 1 January 1964	462.52		<i>Cash :</i>	
	Add : Excess of revenue over expenditure as per attached account ..	1,013.62		At Barclays Bank DCO	510.03
		1,476.14		On Hand	
	Less : Transferred to Parent Body during the year	862.51	111.82	Cape	12.80
462.52				Transvaal	28.90
		613.63			551.73
<u>R967.27</u>		<u>R1,011.23</u>	<u>R967.27</u>		<u>R1,011.23</u>

REVENUE AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31 DECEMBER 1963

1963		1964	1963		1964
R	R	R	R	R	R
11.01	Bank Charges	10.31	7.00	Entrance Fees	18.00
169.64	Meeting Expenses	82.65	1,175.72	Subscriptions	1,212.70
41.10	Entertainment Expenses ..	19.39	19.62	Interest	11.18
47.32	Postage and Cables	44.82	.90	Sale of Publications	—
52.46	Stationery and Printing ..	66.89			
15.00	Honorarium	—			
	Subscriptions—Natal Association of Scientific and Technical Societies	4.20			
4.20		4.20			
862.51	Carried to Balance Sheet ..	1,013.62			
<u>R1,203.24</u>		<u>R1,241.88</u>	<u>R1,203.24</u>		<u>R1,241.88</u>

Audited and found correct

H. T. BRYAN
Hon. Auditor.

K. M. ENGELBERT
Hon. Treasurer.

South Australian

Honorary Officers and Committee

Chairman	Mr. H. D. Bruce
Vice-Chairman	Mr. I. D. Pike
Immediate Past Chairman	Mr. A. E. Allen
Hon. Publications Officer	Mr. K. L. Jones
Hon. Treasurer	Mr. W. F. Churcher
Hon. Secretary	Mr. A. E. Allen
Hon. Auditors	Mr. J. S. Mercer
	Mr. H. McConville
Proxy to AFC	Mr. K. R. Bussell

Committee :

Mr. K. A. Metcalfe, Mr. J. S. Boroky, Mr. J. W. A. Matthews, Mr. P. C. Westcott, Mr. R. K. Byfield.

Mr. Byfield resigned from Committee in October to return to the United Kingdom and was not replaced on Committee.

Attendance at the nine Committee Meetings held during the year was at a high level and reflected the keen interest of the Committee in OCCA business.

Membership

At 31 December membership was :

	1964	1963
Ordinary	47	46
Associate	29	33
Junior	2	2
	<hr/>	<hr/>
	78	81
	<hr/>	<hr/>

The Section lost several members on transfer to other Sections and also seven were struck off for non-payment of fees. Therefore the membership decrease was not as serious as it could have been, and the signing up of so many new members was most gratifying.

Technical Sessions

The following were the technical sessions for the year :

1964

20 February : Lecturettes : "Amphoteric Surface Agents," by Mr. D. Bruce ; "History and Development of Organic Peroxides," by Mr. R. Byfield ; "Notes on Commercial Detergents," by Mr. P. Donovan.

19 March : Annual General Meeting followed by tenpin bowls.

16 April : "Static Electricity in Chemical Industry," by Mr. J. Cordner, and supporting film.

21 May : Discussion Evening : "The Functions of Advertising."

4 June : (1) "Formulation and Evaluation of House Paint," (2) "Production and Machinery," by Mr. L. A. Hill. These were very successful AFC-sponsored lectures.

9 July : "Moisture in Textiles," by Mr. L. Way. This was a combined meeting with Society of Dyers and Colourists.

20 August : Film Evening : Technical films supplied by Commonwealth Paint Committee and Shell Co.

17 September : "Opacity of Titanium Pigments," by Mr. G. Hartshorn.

15 October : "Leather Finishing," by Mr. B. Lock.

19 November : Works visit : The Griffen Press.

27 November : Annual Dinner. Guest speaker, Dr. I. Jarrett, of CSIRO.

Junior Activities

Due to lack of numbers no special activities were undertaken for Junior Members.

Social Events

Monthly meetings were preceded by dinner at the Castle Motel, Edwardstown. These were always well attended and enjoyed by members.

The two AFC-sponsored lectures in June were attended by some 64 members and visitors and they were interspersed with an excellent dinner, which enabled all to become acquainted with the guest speaker and also each other.

The Annual Dinner was again a great success with Dr. I. Jarrett proving a most entertaining speaker. The Section was honoured to have as guests Mr. J. Rischbieth, Chairman AFC, and Mr. J. Foxton, Chairman of NSW Section.

A most successful Golf Day was again held in May at the Royal Adelaide Links and some 20 members and friends had a splendid afternoon.

Works Visit

Once again a visit to a business house of interest to OCCA members was successfully arranged. This year we visited the Griffen Press and were shown many and varied facets of the printing industry. Members were afterwards entertained at supper by the management of Griffen Press.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS			
1963		1964		1963		1964	
£	s. d.	£	s. d.	£	s. d.	£	s. d.
<i>Meetings :</i>				Balance brought forward .. 189 3 5			
28	16	0	66	18	0	(Cash Book balance less Advance Subs.)	
<i>Social Functions :</i>				116	17	3	Subscriptions received .. 269 0 0
114	7	9	79	13	0	Advanced Subs. received .. 67 11 3	
<i>General Expenses :</i>				2	10	0	Entrance Fees .. 5 0 0
52	8	6	159	11	9	Social—Xmas Dinner .. 52 10 0	
92	8	4	138	15	0	Other Social Functions .. 29 0 0	
144	12	0	Travelling and Accommodation (AFC) .. 51 1 6			Refund of Travelling Expenses	
188	15	0	Balance as per Cash Book .. 174 1 9			from AFC .. 51 1 6	
<hr/>				Refund from RMI .. 3 3 0			
<hr/>				Interest from Bank .. 3 11 10			
<hr/>				<hr/>			
£621 7 7		£670 1 0		£621 7 7		£670 1 0	

Audited and found correct.

Bankers : Bank of New South Wales, Edwardstown, South Australia.

Federal Committee Activities

Mr. D. Bruce and Mr. A. Allen were appointed as South Australian delegates to the AFC and attended the Annual General Meeting held in conjunction with the sixth Australian Convention at Warburton in July. Many hours were spent by both delegates and other members of Committee on AFC matters and progress was made in a number of activities.

The South Australian Section are the headquarters for the reissue of the RMI and the Sub-Committee concerned consists of :

Chairman	..	..	..	..	Mr. D. Bruce
Secretary/Treasurer	..	..	..	..	Mr. I. Pike
Publications Officer	..	..	..	..	Mr. K. L. Jones

These members have spent uncountable hours voluntarily compiling and editing entry material for the second issue, and present indications are that it will be ready for issue approximately mid-1965 and will not be a financial burden to the AFC, which will sponsor this volume.

Acknowledgments

The Section expresses thanks to all speakers of the past year who so ably presented papers for the benefit of members.

Sincere thanks also go to Mr. K. R. Bussell, who so ably represented the South Australian Section as our proxy representative on the AFC.

Mr. D. Gilham was instrumental in organising the most successful Golf Day and various business houses contributed prizes, and all who took part owe thanks for these services.

Messrs. A. C. Hatrick Pty. Ltd. and W. P. Crowhurst Ltd. contributed greatly by the willing loan of their offices for Committee Meetings.

In conclusion we must thank the Chairman, Mr. D. Bruce, for his very able and conscientious leadership throughout the year and also to all Committee Members for an outstanding year's work.

Victorian

Honorary Officers and Committee

Chairman	Mr. J. F. Walker
Immediate Past Chairman	Mr. D. Cairns
Immediate Past Secretary	Mr. B. A. Wilcher
Vice-Chairman	Mr. F. D. Funnell
Hon. Secretary	Mr. F. Marson
Hon. Assistant Secretary	Mr. L. A. Hill
Hon. Treasurer	Mr. M. Pack
Hon. Publications Officer	Mr. D. W. Berryman
Hon. Programmes Officer	Mr. R. M. Fels
Hon. Social Secretary	Mr. J. S. Herron
Hon. Auditors	Mr. S. R. J. Nicholls, Mr. R. C. Turndell

Committee :

Mr. N. F. Daniel, Mr. P. B. Lummis, Mr. G. P. Hartshorn.

Eighteen Committee Meetings were held during the year.

Sub-Committees :

Finance : Mr. J. F. Walker, Mr. F. Marson, Mr. F. D. Funnell, Mr. M. Pack (Convenor), Mr. P. B. Lummis.

Sixth Australian Convention : Mr. J. F. Walker, Mr. F. D. Funnell, Mr. F. Marson (Convenor), Mr. D. W. Berryman, Mr. J. S. Herron, Mr. N. F. Daniel, Mr. P. B. Lummis, Mr. G. P. Hartshorn, Mr. D. Cairns, Mr. I. Buckingham, Mr. D. Kalwig, Mr. P. Rundle.

This Sub-Committee held 23 meetings during the year.

Social : Mr. J. S. Herron (Convenor).

Membership

Membership of the Section as at 31 December 1964 was as follows :

					1964	1963
Ordinary	..	..	..	..	213	201
Associate	..	..	..	..	83	86
Junior	..	..	..	..	28	31
					<hr/>	<hr/>
					324	318
					<hr/>	<hr/>

The increase in overall membership was six during the 1964 term ; the increase in Ordinary membership was partially due to upgrading of Associate and Junior Members.

Meetings

Monthly Ordinary Meetings were held on the second Monday of each month with the exception of July, when no Ordinary Meeting was held as it was felt that it would clash with the Sixth Convention, which was held on 16. to 19 July.

Details of the 1963-64 meetings are as follows, attendances being shown in parentheses :

1964

March : Annual General Meeting (58).

April : "Static Electricity in the Paint Industry," by Mr. J. Cordner (66).

May : "Modern Dispersion Techniques," by Mr. A. E. Donaldson (50).

June : Works visit to BALM Paints Pty. Ltd. (82).

August : "Gas Phase Chromatography," by Mr. W. H. Thompson (48).

September : "Progress with Polyesters," by Mr. J. Samios (55).

October : "Castor Oil and Derivatives as Surface Coating Materials," by Mr. K. J. Rees (51).

November : "Pigments in Printing Inks," by Mr. A. R. Barlee (58).

December : Annual Dinner. Guest speaker, Mr. I. Newham (98).

1965

February : "Solvent Balance," by Mr. A. J. Mahoney (61).

Special General Meeting

A Special General Meeting was held on 23 November to discuss the financing of the *Proceedings and News* and Victorian Section relationship with Council. Approximately 70 voting members attended.

Sixth Annual Convention

The Victorian Section were hosts for the Sixth Convention, which was held at Warburton Chalet on 16 to 19 July 1964. One hundred and sixty-four delegates attended the Convention, making this the best attended Australian Convention to date. The lectures were of high standard throughout and may appear in the *Journal* or *Proceedings and News*. The Committee wish to thank members who gave so freely of their time in attending the 23 Committee meetings culminating in the Convention.

Social Programme

During the year informal pre-meeting dinners were held; the average attendance was 60 members. The attendance at the Annual Dinner was 98.

The Annual Golf Day was held on 17 March and 64 players and guests attended, an increase of 19 over last year.

Ladies' Night was again held at Dennis House on 23 October. One hundred and eight members, ladies and friends attended.

The Past Chairman's Dinner was held at the Danish Club on 11 September.

A very successful wine tasting buffet was held on 28 April; 118 members and friends attended to sample Australian wines and cheeses.

Australian Federal Committee

The Committee held its fifth full meeting at the Sixth Australian Convention at Warburton, Victoria. The Victorian Committee appointed Mr. J. F. Walker and Mr. F. D. Funnell as delegates; Mr. J. R. Rischbieth, one of last year's delegates, was re-elected as an independent Chairman for the term 1964-65. Proxy meetings have been held in Melbourne, and Federal Committee papers have provided the basis for much spirited discussions both in and out of Committee.

Acknowledgments

The Committee wishes to thank the following gentlemen for their assistance during the year: Mr. P. J. Gay, Australian Representative on Council, and Mr. R. H. Hamblin, General Secretary.

The Committee also wish to thank the University of Melbourne, Hardie Trading Ltd., Kaylo Pty. Ltd., S. Smith & Co. Pty. Ltd. and ICIANZ Ltd. for the use of meeting rooms.

FINANCIAL STATEMENT 1664

1963			1964			1963			1964		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
PAYMENTS						RECEIPTS					
153	0	6	220	13	7	1,150	16	3	1,212	1	8
48	15	3	48	16	0	85	10	0	106	17	6
421	1	11	211	19	3	22	0	4	26	5	10
60	0	0	72	2	0	—	—	—	11	9	4
675	9	0	903	3	6						
—	—	—	—	—	—						
<u>£1,358 6 8</u>			<u>£1,456 14 4</u>			<u>£1,358 6 8</u>			<u>£1,456 14 4</u>		

Audited and found correct

R. C. TRENDELL
S. R. J. NICHOLLS
Hon. Auditors.

Bankers : National Bank of Australasia Ltd. Barkly Street, Footscray, Victoria, Australia.

M. PACK
Hon. Treasurer.

Wellington

Honorary Officers and Committee

Chairman	Mr. T. W. Slinn
Secretary	Mr. G. F. Browne
Treasurer	Mr. J. Jervis
Publications Officer :	Mr. G. P. Cryer
Immediate Past Chairman	Mr. A. H. McEwan

Committee

Mr. M. D. Thomson, Mr. J. A. Eaton, Mr. J. J. Campbell, Mr. R. D. Bell, Mr. D. M. Carter, Mr. C. W. Reid.

Eight Committee Meetings were held during the year, with an average attendance of seven members. The aim of having these meetings on a monthly basis has been maintained and largely achieved.

Membership

	1964	1963
Ordinary	45	38
Associate	20	24
Junior	—	—
	<u>65</u>	<u>62</u>

General Meetings

Five General Meetings were held during the year, with an average attendance of 19.

1964

19 March : Annual General Meeting.

7 May : Instrument Evening.

19 June : Film Evening : "Safety in Industry," "Materials Handling," "Prospects for Plastics."

30 July : " Effective Use of Titanium Dioxide," by Mr. R. D. Bell.

22 October : " Pigment Extenders and Filler in New Zealand," by Mr. D. S. Nicholson.

Wairakei Convention

This year the Annual Convention of the two New Zealand Sections was held in Wairakei on Saturday and Sunday 15 and 16 August. The organisation of this Convention was the responsibility of this Section and to this end a sub-committee comprising Mr. A. McEwan (Chairman), Mr. W. Thompson and Mr. W. James was set up. The attendance at Convention was very good, including quite a number of members who were accompanied by their wives. The obvious popularity of this event promises well for the future of this, now established, annual get together of the two Sections.

The programme consisted of a get together on the Friday evening, on Saturday the Official Opening and a business session in the morning, the golf match in the afternoon and short business session followed by a Social in the evening. Sunday morning was the Combined Committee Meeting followed by the Official Closing of the Convention. A Ladies programme of golf and sightseeing tours were also arranged. Three papers were presented, " Hiding Power Measurement in White Paint," by Mr. G. P. Hartshorn, " Accident Prevention—an Integral Function of Efficient Management," by Mr. N. A. Dunshea, of the National Safety Association, and " Vegetable Oils in Paints and Resins," by Mr. A. J. D. Robb.

The total attendance was 62, from this Section 14 members, some accompanied by wives, making a total party of 24, went to Wairakei.

Social Events

Our Annual Golf Day was held on 16 September at the New Judgeford Golf Club. Fourteen members and four visitors attended, which was slightly down on last year. Increased support for this annual event would be most rewarding and make the efforts of those organising it more worth while.

Ladies Night was held on 28 November at the Seaway Cabaret. This was a most enjoyable function in which most people stayed for the Cabaret after the buffet Cocktail Party finished.

Pre-meeting dinners have continued to be held at the Pier Hotel, with an average attendance of 16 members. This is slightly lower than the previous year which is a great pity for it gives members a chance to get together and enjoy a sociable hour or more before our formal meetings.

Other Activities

At the end of August, Mr. N. A. Bennett, a Past President of OCCA arrived in New Zealand. Unfortunately, because of a very tight business schedule, he was not able to attend a meeting of the Section. However, he was able to attend a Cocktail Party at which he met the Officers and Committee of the Section and a number of past Chairmen and members before departing for Christchurch. Mr. Bennett brought greetings from the President and Council, and, although time was short, some matters of mutual interest were discussed.

Acknowledgments

Once again we have been fortunate in having the use of the Shell Theatre for our meetings.

Our grateful thanks are extended to Hon. Auditor, Mr. N. Donkin.

The Chairman would like to take this opportunity to thank the Officers and Committee of this Section for the support they have given him and the enthusiasm they have displayed in the organisation of the various activities carried out during the year. Particularly, he would like to thank the Secretary, Mr. G. Browne, for the able and willing assistance he has given the Chairman throughout the year and also Mr. A. McEwan for the helpful advice and guidance received.

In addition, the Chairman wishes to thank the Wairakei Convention Sub-Committee for the outstanding job they did in making this year's convention the success that everyone who attended agreed that it was.

FINANCIAL STATEMENT 1964

PAYMENTS				RECEIPTS						
1963		1964		1963		1964				
£	s.	d.	£	s.	d.	£	s.	d.		
<i>Meetings :</i>				<i>Balance brought forward</i> ..				77	10	5
16	14	6	Hire of rooms, Refreshments, ..	33	15	0	192	3	0	
—	—	—	hire of projector ..	10	4	3	<i>Outstanding Subscriptions 1963</i>			
<i>Wairakei Convention ..</i>				<i>Entrance Fees</i> ..				3	0	0
<i>Social Functions :</i>				<i>Bank Interest</i> ..				5	1	0
13	1	6	Ladies' Night, Golf Day ..	18	7	3	<i>Exchange</i> ..			
150	0	0	Remit to London ..	103	13	0	<hr/>			
<i>General Expenses :</i>				<hr/>				£284	1	5
<i>Postage, Printing and</i>				<i>Stationery, Bank Charges</i> ..				27	4	10
19	6	5	Stationery, Bank Charges ..	2	0	0	<hr/>			
2	7	0	PO Box Rental and Lock ..	88	17	1	<hr/>			
8	5	0	Technical Books ..	<hr/>				£287	5	11
77	11	6	Balance as per Cash Book ..	<hr/>				£284	1	5
<hr/>				<hr/>				<hr/>		
£287	5	11		£284	1	5				

Audited and found correct

N. DONKIN
Hon. Auditor.

Bankers : Australia & New Zealand Bank Ltd.,
Courtenay Place, Wellington, New Zealand.

J. JERVIS
Hon. Treasurer.

West Australian

Honorary Officers and Committee

The fifth Annual General Meeting of the West Australian Section was held on Thursday 19 March at 8 p.m. The following Officers were elected and opposed :

Chairman	Mr. D. Cole
Vice-Chairman	Mr. R. Johnson
Hon. Secretary	Mr. G. Parsons
Hon. Treasurer	Mr. E. Fletcher
Hon. Publications Officer	Mr. P. Wilson
Hon. Auditors	Mr. J. Evans, Mr. A. Golding
Delegates to the AFC	Mr. D. Cole, Mr. G. Parsons

Committee

Mr. A. Doig, Mr. G. Langmead, Mr. P. Murphy, Mr. A. Sullivan.

The Victorian member who acted as our proxy at AFC meetings in Melbourne was Mr. C. G. Bray.

The Committee held six meetings during the year.

Membership

There were several new members and several resignations during the year, but the overall total membership remained fairly steady.

The total membership as at 28 February 1965 is set out below compared with the membership as at 30 December 1963.

Ordinary	22+2 new not recorded	18
Associate	19	19
Junior	3	3
	<hr/>	<hr/>
	40	40
	<hr/>	<hr/>

Meetings**1964**

19 March : Annual General Meeting.

19 May : Smoke Social.

9 June : Sponsored Lecture by Mr. L. Hill.

11 August : Discussion of Painting of Karri (cancelled).

8 September : Discussion of Painting of Karri.

13 October : Bowls Night.

19 November : Mr. Robinson, of LaPorte.

December : Annual Dinner and Golf Day.

Social Events

The pre-meeting dinners held at the Manning Hotel proved to be popular.

Another golf tournament took place at Mt. Lawley Golf Club on 2 June 1964 between Section members and the PIA. Unfortunately, PIA had the upper hand this year.

A bowls night was organised at Fairlanes Bowling Alley for the meeting, but was a disappointment as far as attendance was concerned.

Meeting Notices

Once again we wish to thank Balm Paints Ltd., through Mr. I. Hand and Mr. W. Earnshaw, for making available their copying machine for our monthly notices.

FINANCIAL STATEMENT 1964

PAYMENTS			RECEIPTS		
1963			1964		
A£	s.	d.	A£	s.	d.
Meetings : Hire of rooms, refreshments, reporting, hire of projector, etc. 29 15 0 Fares to Australian Federal Committee Meeting .. — — — Sale of Official Publication .. 26 0 6 Social Functions .. 138 9 10			Balance brought forward .. 118 19 4 Entrance Fees 1 17 6 Subscriptions 189 8 9 Social Function : Receipts from ticket sales .. 137 19 7 Refund of fares to Australian Federal Committee Meeting .. — — — Interest 3 4 2 Sale of books 15 14 0 Bank Refund — — —		
General Expenses : Printing, Stationery, postage and telephone, etc. 52 16 3 Entertainment of Lecturers .. 12 4 0 Transfer to Council .. 84 8 1 Balance as per Cash Book .. 123 9 8					
<u>A£574 7 0</u>			<u>A£467 3 4</u>		
Audited and found correct			Bankers: Australia and New Zealand Bank, High Street, Fremantle, Western Australia. E. FLETCHER <i>Hon. Treasurer.</i>		

West Riding

Honorary Officers and Committee

The Officers and Committee for the past year have been as follows:

Chairman	Dr. K. Hargreaves
Vice-Chairman	Mr. N. Cochrane
Hon. Secretary	Mr. D. H. du Rieu
Hon. Treasurer	Mr. T. R. Smith
Hon. Publications Secretary	Dr. L. J. Watkinson
Representative on the Council	Mr. P. M. Haigh
Assistant Publications Secretary	Mr. J. N. McKean
Hon. Social Secretary	Mr. M. J. Cochrane
Hon. Auditor	Mr. P. M. Haigh

Committee :

Mr. J. M. P. Denny, Mr. J. M. Shields, Mr. M. J. Cochrane, Mr. J. Weir,
 Mr. A. Hearson, Mr. F. Moreham, Mr. L. Silver, Mr. C. Allsop. Ex-officio Member
 Mr. J. E. Arnold.

Membership

					1964	1963
Ordinary	..	..	..	..	62	65
Associate	..	..	..	..	15	22
Junior	..	..	..	..	6	5
					<hr/>	<hr/>
					83	92
					<hr/>	<hr/>

Meetings

Six technical meetings were held during the course of the year :

1964

8 September : " Staff for the Paint Industry," by Mr. M. H. M. Arnold (14 members, 1 guest).

13 October : " Crystal Form and Colour Properties of Pigments," by Dr. D. Patterson of the Department of Colour Chemistry, Leeds University (22 members, 13 guests).

10 November : " Theory and Practice in the Use of Colour," by Miss A. Rathbone (19 members, 8 guests).

1965

12 January : " Fuoric Acid in Alkyds," by V. F. Jenkins (19 members, 1 guest).

25 February : Joint meeting with the Society of Chemical Industry on Pigment Wetting. Introductory paper " Pigment Dispersion Agents," by Mr. Schwitzer and " Pigment Dispersion and Pigmentation Structure," by Mr. R. J. Cole of the Paint Research Station (25 members, 39 guests).

9 March : " Epoxy Resins," by Mr. A. J. G. Shaw (13 members, 3 guests).

Except for the joint meeting with the Society of the Chemical Industry, which had a very large attendance, the average attendance at lectures was lower than it had been for the last few years. In some cases the attendance was very poor and it is hoped that in the coming session members will make a greater effort to attend the technical meetings.

Social Events

The Annual Dinner-Dance of the Section, held at the Granby Hotel, Harrogate, in November, again had a record attendance and maintained its usual high standard.

FINANCIAL STATEMENT 1964

1963		PAYMENTS		1964		1963		RECEIPTS		1964				
£	s.	d.		£	s.	d.	£	s.	d.	£	s.	d.		
			<i>Meetings :</i>				22	12	4	Balance brought forward	..	107	0	5
			Hire of rooms, refreshments,				100	0	0	Council Grant	..	125	0	0
25	7	0	reporting, hire of projector,				—	—	—	Sale refreshments at meetings	14	3	2	
			etc.	39	4	3			<i>Social Functions :</i>					
			<i>Social Functions :</i>				275	1	0	Tickets, etc. .. ..	..	345	0	3
243	11	2	Band, guests, etc.	405	14	1	9	1	6	Petty Cash .. ..	..	4	4	0
			<i>General Expenses :</i>				20	15	3	Unpresented cheques	..	—	—	—
			Printing, Stationery, telephone											
7	11	0	bank charges, postage and											
			sundries	28	11	6								
			<i>Entertainment :</i>											
19	1	3	Lecturers	18	10	3								
127	15	8	Balance as per Cash Book ..	99	3	9								
4	4	0	Cash in hand	4	4	0								
<hr/>				<hr/>			<hr/>					<hr/>		
£427	10	1		£595	7	10	£427	10	1			£595	7	10

Audited and found correct

P. M. HAIGH.
 Hon. Auditor

Bankers : The Yorkshire Bank Limited, Otley Road,
 Shipley, Yorks.
 T. R. SMITH
 Hon. Treasurer

Proceedings of the Annual General Meeting

The Third Annual General Meeting of the Incorporated Association was held on 28 May 1965 at 2.15 p.m. at the Palace Hotel, Torquay, Devon.

Apologies

An apology for absence was received from Mr. S. A. Ray.

Minutes

The President (Dr. J. E. Arnold) stated that he had received no comments on the Minutes of the Annual General Meeting held on 17 June 1964, as printed and circulated in *JOCCA* 1964, 47, 638-643. There being no comments, the adoption of the Minutes was put to the meeting and carried unanimously. The President then signed the Minutes.

Annual Report of the Council for 1964

Mr. I. C. R. Bews (Honorary Secretary) moved the adoption of the Annual Report of the Council for 1964.

He drew particular attention to the commencement, on 1 March, of the Association's Research Project at Nottingham University by Dr. K. E. Lewis, under the supervision of Dr. G. D. Parfitt and which he understood was progressing satisfactorily.

Mr. Bews also drew attention to Council's decision in respect of the OCCA tie which he was glad to see being worn by so many members at the meeting.

Finally, Mr. Bews referred to the publication of the *Australian OCCA Proceedings and News*, the first issue of which had appeared in January 1964 and which the Honorary Officers had been interested to receive each month since that date.

Mr. F. Sowerbutts (Honorary Treasurer) seconded the adoption of the Annual Report and pointed out that the Income and Expenditure Account for the year, as well as the Balance Sheet as at 31 December 1964, which were included in the Annual Report, had been approved by the Finance Committee and the Council.

There being no comments or questions on the Annual Report and statement of accounts, these were formally adopted by the meeting.

Election of President

Dr. Arnold stated that he now had the pleasant task of asking the Annual General Meeting to ratify the Council's nomination for the office of President of the Association and he felt sure that the members present would agree that there could be no better nomination than that of his old friend, Dr. Sydney Bell. Dr. Bell had been adviser, mentor and friend to so many members over the years that Dr. Arnold felt it hardly necessary to enlarge further upon his

qualities. He, therefore, formally proposed to the meeting that Dr. Bell be elected President.

This was carried unanimously and with acclamation.

Dr. Bell thanked the meeting for the confidence shown in him and pledged his best endeavours to serve the Association as its President. During his term as President Designate he had learned to appreciate the excellence of his predecessor and he now looked forward to working with the team of Honorary Officers which the Association was fortunate to have. In addition to this Dr. Bell was glad to note the names of the Vice-Presidents who would be serving with him, particularly the representative from the General Overseas Section, Dr. H. W. Talen.

Election of Vice-Presidents of the Association

The President asked the meeting to elect as Vice-Presidents the following, pointing out that since the Agenda for the meeting had been printed, the nomination of Mr. J. C. Anner had been received from the Queensland Section Committee and approved by Council.

(a) Vice-Presidents who have not been President

Mr. A. Aitkenhead
Mr. J. C. Anner
Mr. F. Evans
Mr. A. S. Fraser
Mr. J. Smethurst
Dr. H. W. Talen

(b) Vice-President who has been President :

Mr. N. A. Bennett

It was unanimously agreed to elect these members as Vice-Presidents.

On behalf of the members of the General Overseas Section, Dr. Talen expressed his appreciation to the Association for the honour bestowed upon him and stressed the importance of the role which OCCA played in the world, particularly so far as the *Journal* was concerned. In addition, he thanked the Association for the hospitality which members from overseas always enjoyed at the Technical Exhibitions and Conferences.

Election of Honorary Officers of the Association

It was unanimously agreed to elect the Honorary Officers as follows :

Honorary Secretary	..	..	..	..	..	Mr. I. C. R. Bews
Honorary Treasurer	..	..	..	..	..	Mr. F. Sowerbutts
Honorary Editor	..	..	..	..	..	Mr. D. S. Newton
Honorary Research and Development Officer	..	..	..	..	..	Mr. A. T. S. Rudram

Announcement of Election of Three Elective Members to Council for 1965-67

The President read the following report which had been received from the Auditors :

We have scrutinised the voting papers for the three elective members of the Council, received from the members in the United Kingdom and General Overseas Section, and certify that the votes cast, including those notified by

letter from the South African and Victorian Sections, show that the following obtained the largest number of votes :

1. *T. E. Johnson* 2. *N. H. Seymour* 3. *H. C. Worsdall*

18 voting papers were rejected as not being in order.

London, 18 May 1965

*Cooper Brothers & Co.,
Chartered Accountants.*

The President then declared the three members listed elected to Council.

Chairmen of Sections for the Coming Session

The names of the Chairmen for the coming year were give as follows :

Auckland	..	..	..	..	Mr. P. B. Hunt
Bristol	..	..	..	..	Mr. R. J. Woodbridge
Hull	..	..	..	..	Mr. A. J. Ford
London	..	..	..	..	Mr. C. R. Pye
Manchester	..	..	..	..	Mr. H. F. Clay
Midlands	..	..	..	..	Mr. R. D. Calvert
Newcastle	..	..	..	..	Mr. E. L. Farrow
New South Wales	..	..	..	..	Mr. M. J. Leahey
Queensland	..	..	..	..	Mr. G. Smith
Scottish	..	..	..	..	Dr. D. Atherton
South African	..	..	..	..	Mr. F. Schollick
South Australian	..	..	..	..	Mr. H. D. Bruce
Victorian	..	..	..	..	Mr. F. D. Funnell
Wellington	..	..	..	..	Mr. T. W. Slinn
West Australian	..	..	..	..	Mr. E. G. Fletcher
West Riding	..	..	..	..	Mr. N. Cochrane

Appointment of Auditors and fixing the remuneration thereof

It was proposed by Mr. D. J. Morris that Cooper Brothers & Company be re-appointed Auditors of the Association and that their fee be 100 guineas (exclusive of the fee paid for the auditing of the accounts of the Australian Federal Committee). This was seconded by Mr. P. Walker and carried unanimously.

Vote of thanks to retiring President

Dr. Hampton reminded the meeting that when he had introduced Dr. Arnold as President Designate and later as President, he had referred to his abilities as a business executive, a scientist and an organist and in all these capacities he had served the Association very well indeed. On two occasions at Past Presidents' Dinners in Wax Chandlers' Hall, Dr. Arnold had provided musical entertainment for the assembled company and during the Thursday evening of the current Conference he had charmed his audience at an organ recital given at the local church.

He noted that Dr. Arnold's technical knowledge had been of great benefit when selecting the subject for the Association's Research Project and that during his term of office, he had, together with Dr. Bell, taken the Chair at the Symposium on "Electrodeposition of Paint" organised by the Midlands Section. On these occasions he had displayed his scientific abilities as he had

also done with skill and tact at the Foundation Lecture in June last when the speaker at the last minute changed the title of his lecture from "Interdisciplinary Research in Coatings" to "Three Stages and a Quartessence."

Referring to Council's decision to defer the publication of the History of the Association to coincide with the 50th anniversary, Dr. Hampton pointed out that when it was brought up to date the authors would have the opportunity of referring to Dr. Arnold as an unique President for at least two reasons ; one, as being not only the first member, and certainly the first President, to wear the OCCA Tie and two, as being the first President to give an organ recital during the course of the Conference.

Dr. Hampton also reminded the meeting that Dr. Arnold had served the Association for many years as the Honorary Secretary and no doubt this had helped him to fulfil the duties of President so ably. When Dr. Arnold's name appeared in the list of Presidents in the Association's *Journal*, Dr. Hampton felt sure it would stand out in the minds of many members as that of a President who had served the Association very well indeed.

Before concluding his vote of thanks, Dr. Hampton made reference to Mrs. Arnold and said that her charming manner had graced many social occasions of the Association and that her friendly disposition had helped the ladies to feel at ease. Dr. and Mrs. Arnold had visited all the Sections in the UK and Dr. Hampton felt sure that she had been a tower of strength to Dr. Arnold, particularly during the more difficult periods of his term of office. In addition to many other things, he suspected that she had helped him with the speech he had delivered at the FATIPEC Congress at Vichy when he had paid his hosts the compliment of addressing them in their own language. Dr. Hampton felt that he was speaking on behalf of the entire membership of the Association when he said that Dr. Arnold and his lady had indeed upheld the dignity of this high office on the occasions when they had represented the Association.

The vote of thanks was carried unanimously and with acclamation.

In thanking Dr. Hampton for his generous remarks, Dr. Arnold said that he regarded it as a very great privilege to have served the Association as President. As he had already learned in business, the senior position in any organisation tended to be a lonely one and he took the opportunity of thanking the Honorary Officers and Members for the many kindnesses they had shown both to him and to Mrs. Arnold during his term of office and particularly for their consideration and support in times of stress.

Vote of thanks to retiring Council Members

The President called upon Mr. V. C. Thompson to propose a vote of thanks to the members retiring from Council.

Mr. Thompson commented on the fact that the constitution of the Council provided a good balance of continuity and new ideas through new members, but to achieve this it was necessary to limit the term of office of Council Members. This year there were 15 retiring members from four different categories who had all worked with one aim—the advancement of the Association.

It was always a sad moment when Council Members retired, but it was comforting to know that the constitution provided for the members concerned

to serve again in some capacity at a later date. He therefore asked the meeting to show its appreciation of their work in the usual way. The vote of thanks was carried with acclamation.

Vote of thanks to the Honorary Officers of the Association

Mr. A. R. Penfold, in proposing a vote of thanks to the Honorary Officers, said that he welcomed the opportunity to do so. He expressed appreciation of the service which the Honorary Officers had rendered during their terms of office which had contributed greatly during the period under review towards the high international reputation of the Association. From his limited personal acquaintance, he therefore had much pleasure in proposing a vote of thanks to the Honorary Officers for their services rendered during the past year, coupled with best wishes for a very successful term of office during the ensuing year. The vote of thanks was carried with acclamation.

Any other business

Vote of thanks to General Secretary (Mr. R. H. Hamblin) and his Staff.

Mr. F. Sowerbutts did not want this opportunity to pass without according the thanks of the members to the permanent staff of the Association. During the past year Mr. Hamblin had successfully accomplished the transfer of the Exhibition from the Royal Horticultural Halls to Alexandra Palace and he was sure that the Association could not have a more conscientious General Secretary. While mentioning the Exhibition, Mr. Sowerbutts also paid tribute to the work carried out by Mr. H. C. Worsdall and Mr. J. A. L. Hawkey, who were members of the Exhibition Committee together with the Honorary Officers, and to Mr. K. Pond and Mr. C. H. Kersey who had also rendered assistance. He reminded the meeting that the Association's Technical Exhibition had reached a high international reputation and in that respect it was something of which the Association could be very proud.

Mr. Sowerbutts then asked the meeting to show its appreciation to Mr. Hamblin and his staff in the usual way. The vote of thanks was carried with acclamation.

There being no other comments or business, the President declared the meeting closed at 2.58 p.m.

Comment

Raw Materials Index

We have been very pleased to receive the second edition of the *Australian OCCA Raw Materials Index*, published under the sponsorship of the Australian Federal Committee of the Oil and Colour Chemists' Association.

The book, which differs from the first issue in that it is contained in a loose-leaf binder, was prepared by a sub-committee (composed of members of the South Australian Section) of the Australian Federal Committee. It is felt that the usefulness of the publication is increased by the inclusion of a comprehensive general first reference index and a new system of numbering the pages. From the foreword it is evident that amendment sheets will be issued and the addition of these will not throw out the numbering of the pages.

The Australian Federal Committee and the RMI sub-committee are to be congratulated on producing an excellent publication which will be of considerable value not only to members in Australia but also to anyone interested in the Australian paint industry.

Section Proceedings

New South Wales

Industrial Water Thinnable Coatings

The May meeting of the Section was held on 20 May, when Dr. L. Kovacs spoke on "Industrial Water Thinnable Coatings."

Until 1962, Dr. Kovacs was chief resins chemist of Taubmans Group Factories at Villawood, NSW. He spent the following two years in Europe, formulating industrial finishes, co-ordinating laboratory development projects and technical service. In 1964 he returned to Sydney and joined Taubmans Industries Ltd.

In his talk at the meeting, he drew attention to the swiftly growing demand for water-thinnable industrial coatings. The automotive industries in Europe and United States were already large consumers of aqueous underbody dip primers and surfacers. Electrical application was another stimulus for water-based primers. Metal furniture and domestic appliance manufacturers showed increasing interest in water reducible baking finishes and undercoats.

Dr. Kovacs then described the chemistry of some of the typical water soluble binders such as maleinised oils, alkyds, acrylics, phenolics, amino resins and epoxy esters. The first three were good grinding media for pigments and extenders. Strontium chromate, basic lead silico chromate, barium metaborate were active corrosion inhibiting pigments. The most helpful coupling solvent was butyl glycol. pH-control is essential for the viscosity stability of the paints and influences baking characteristics and blistering of baked coats. The aqueous baking paints were quite suited for conventional application (spraying, dipping).

Generally, temperatures required for full bake were still higher than in organic-solvent-thinnable systems. The developments of relatively inexpensive resins requiring 250° F for full cure would enable formulators to produce high quality aqueous enamels.

A discussion followed Dr. Kovacs, lecture and then an interesting film from Snowy Mountains Scheme was shown.

A. A.

West Riding

Epoxy Resins

For the last Technical Meeting of the session, on Tuesday 9 March, the Section welcomed Mr. A. J. G. Shaw, who gave a lecture on "Epoxy Resins."

The speaker opened his subject with a general discussion on the nature and properties of epoxy resins. This class of resins, he said, had gained a strong place in resin technology due to its many useful properties and resistance to many chemicals. Epoxy resins had found application in surface coatings, sealants, laminates, tooling, flooring, adhesives, electrical work and foams.

The application of most interest to the present audience he thought would be that of the surface coating field and he discussed one pack, two pack, air- and high temperature-cured, solventless and high solids solvent systems. One criticism of the solventless system was that if air bubbles were trapped in the coating, thin spots resulted.

He next discussed additives that could be incorporated into paint systems, e.g., to stop flow on vertical surfaces. Materials such as Bentones or Aerosils could be used. Such products generally affected the pot-life of the system and added colour. By suitable selection the resistance of the final film could be increased, for example when quartz or silica is used as filler.

For electrical work, he said, one had to be very careful in the type and amount of curing agent used as gross faults due to contraction could be encountered, especially if the resin cured too quickly. Mr. Turner, who had accompanied Mr. Shaw, then gave a dramatic demonstration of the effects of over-rapid curing.

One very interesting sideline that had come from this work on epoxy resins was a novel way of producing permanent prints. The method was to mechanically print or paint a design or pattern on to a substrate which had little adhesion for epoxy resins e.g., pvc. Next a thin layer of resin containing the correct curing agent was cast on top of the print. After the resin had set, the epoxy film was stripped from the substrate, which took away the printed design firmly keyed to the epoxy film.

Mr. Shaw then discussed the use of epoxy resins in laminations together with the major problem of "blooming." Bloom, he said, was caused by water vapour being absorbed by the resin, a complex was then formed which was sticky and this gave rise to the visible phenomenon of bloom.

In conclusion Mr. Shaw thought that the future was still good for epoxy resins as they had many widespread applications despite the fact that they could not be very satisfactorily foamed. In this respect, he said, the polyurethanes were far superior and he suggested that they may become the resins of the future.

In opening question time, Mr. N. Cochrane asked if the "latent thixotropy" Mr. Shaw had mentioned earlier was lost by heating. Mr. Shaw replied that it was not and pointed out that the term "thixotropy" when used in the tooling trade referred to something that did not flow.

Mr. Smith asked whether nylon reinforcement would not be stronger than glass. Mr. Shaw answered that nylon was not "wet" by epoxy resins nor could it be treated to do so in the same way as glass, therefore for flexural stresses glass gave the stronger laminate. Hessian was good in that it soaked up the resin readily but its tensile strength was poor.

Mr. M. Cochrane asked what advice would Mr. Shaw give to people on the use of zinc-rich epoxy paints. Obtaining a clean surface was the first thing Mr. Shaw suggested and then applying the coating at a sufficient thickness to cover the indents of the shot-blasting i.e., about 250 square yards per gallon.

Mr. D. H. du Rieu inquired if the speaker had any knowledge of additives which were manufactured in the United States which were alleged to stop epoxy films from yellowing. Mr. Shaw replied that only two years ago he had made a tour of the United States and had not been able to find anything of this type.

Mr. Smith asked what other effective treatment could be given to metal besides shot-blasting, to which Mr. Shaw replied that wire-brushing and phosphoric could be used but these were not so effective.

Mr du Rieu thought that the problem of crystallisation was increasing and Mr. Shaw agreed, saying that this was due to manufacturers making their resins purer and whiter, when it had been the impurities which had hitherto been restraining the epoxy films from crystallising. This fault was especially noticeable with solventless coatings and was best overcome by the addition of a small amount of active solvent or the use of high-solids coatings wherever possible.

A vote of thanks was given by Mr. M. Cochrane.

J. McK.

Notes and News

Torquay Diary



All photographs by

Marsden & Batley

The President, Dr. J. E. Arnold, is seen opening the technical sessions. (From left to right) Mr. A. T. S. Rudram (Honorary Research and Development Officer), Dr. F. W. Salt; (the Chairman of the first session), The President, Mr. A. Pass and Mr. M. J. F. Meason (joint authors of the first paper)

Recent progress in coatings technology

The Association's Conference was held at Torquay from 25-29 May on the theme of "Recent Progress in Coatings Technology." Over 420 members, non-members, guests and their ladies attended. The headquarters of the Conference was at the Palace Hotel, in which the largest number of those attending the Conference were accommodated, the remainder staying in four hotels around Torquay, from which coaches arranged by the Association conveyed the delegates to the Palace Hotel for the various functions. Thanks are due to the following members who acted as coach stewards: A. E. Claxton, F. W. Davies and W. F. McDonnell. It was thought that the unfortunate coincidence of two conferences in the UK as well as one in France covering the industries during the same period would have an adverse effect on attendance, but it is pleasing to report that numbers were similar to the last two Association Conferences.

Tuesday 25 May

During the day delegates arrived at the five hotels which the Association had allocated for use during the Conference. In contrast to the arrival day at Scarborough two years ago, the weather was cool, but no rain fell. Soon the lounges were full of people renewing old Conference friendships and often making new ones. Before dinner, following the success of the reception at the Scarborough Conference, the President and Mrs. Arnold, together with the Honorary Officers and the General Secretary, entertained Overseas Members and visitors at a reception. Altogether there were 74 visitors from 16 overseas countries, Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Holland, Hungary, India, Italy, Norway, Sweden, Switzerland and the United States.

After dinner the Honorary Research and Development Officer (Mr. A. T. S. Rudram) presided over a meeting of the



The above photograph taken at the Overseas Visitors' Reception shows (from left to right) Mr. H. Meyer (President of the SLF), Mrs. Meyer, The President, Mrs. Arnold, Dr. W. J. Nijveld (President of FATIPEC), Dr. S. H. Bell (President Designate) and Mr. W. H. Hoback (Representative of the FSPT)

Lecturers and Chairmen of the Technical Sessions. At the same time those who were taking part in the tournaments were to be found in deep conversation with the tournament organisers in various lounges of the Palace Hotel. On this occasion the thanks of the members are due to the following members who so ably organised the tournaments: Golf: N. Cochrane; Tennis: R. N. Wheeler; Table Tennis: R. J. Woodbridge.

Wednesday 26 May

The work of the Conference started with the opening of the Technical Sessions by the President, Dr. J. E. Arnold. In a short speech, the President said that the sessions were really the province of the Honorary Research and Development Officer who had arranged the papers, and

thus he would quickly hand the proceedings over to him. Mr. Rudram then introduced the Chairman for the first session, Dr. F. W. Salt, Director of Long Range Research at Sketty Hall BISRA. As the papers and discussions will be printed in full in later issues of the *Journal*, it is not necessary to report them here in detail. However, tribute must be paid to the keenness of the contributors to the discussions for keeping the questions flowing without stopping, which added a great deal to the undoubted success of the Technical Sessions; special mention should be made of the overseas contributors, of which there were many, who took part in the discussions for posing questions of a technical nature in a language not their own.

After the first Technical Session, all



After dinner on the Tuesday the Honorary Research and Development Officer called a meeting of the Chairmen of the sessions and the lecturers. The photograph taken at that meeting shows seated (from left to right) Mr. D. S. Newton (Honorary Editor), Mr. A. T. S. Rudram (Honorary Research and Development Officer) and The President. Standing (from left to right) Dr. F. W. Salt (Chairman), Dr. L. Valentine (Chairman), Mr. A. Pass (Lecturer), Dr. S. Hochberg (Lecturer), Dr. H. Gruber (Lecturer), Mr. R. A. Brett (Lecturer), Mr. J. R. Berry (Lecturer), Mr. A. R. H. Tawn (Lecturer), Dr. J. R. Weber (Lecturer), Mr. L. A. Tysall (Lecturer), Dr. H. Rechmann (Lecturer), Dr. K. M. Oesterle (Lecturer) and Dr. T. Williams (Lecturer). Also present at the Conference but not shown in this picture were Dr. L. A. O'Neill, Mr. M. J. F. Meason (Lecturers) and Dr. W. F. Watson (Chairman)

delegates and ladies were received by the President and Mrs. Arnold at an informal reception.

The afternoon coach tour took delegates through typical Devon countryside to Becky Falls and Haytor. The afternoon was an extremely fine one and many delegates with cameras found much to record in the delightful scenery. Tea was taken at two hotels at Haytor, again typically Devonian with cream in abundance. After a short stroll on the moors which surrounded one of the hotels, and a guided tour round the

other, the coaches wound their way back through the narrow lanes to Torquay.

Following dinner a Civic Reception was held at the Palace, when the Mayor of Torquay, Alderman A. E. Elson, the Mayoress, the Deputy Mayor, Councillor C. W. Kellow, and the Deputy Mayoress, together with the President and Mrs. Arnold, received those attending the Conference. Dancing continued until midnight with a break for a cabaret, consisting of a demonstration of Latin American and Spanish dancing by Phillipe and Olga.



Taken at the first session, the picture shows the interest that the papers aroused. Attendances at the two subsequent sessions were of similar numbers



In the above photograph taken at the Informal Reception there appears (from left to right) Mrs. A. R. Penfold, Mr. L. O. Kekwick (President 1951-53), Mr. I. C. R. Bews (Honorary Secretary), Mrs. Bews, Mrs. Sowerbutts, Mr. F. Sowerbutts (Honorary Treasurer), Mrs. Kekwick and Mr. A. R. Penfold (Honorary Member from Australia)

Thursday 27 May

The second Technical Session was chaired by Dr. L. Valentine, Director of the Paint Research Station. The second paper in the session was the official contribution from FATIPEC and presented in cyclonic fashion by Dr. K. M. Oesterle. While the men were

attending the session a party of ladies attended a cookery demonstration given by Miss Betty Gilley, entitled "Entertaining made easy," at the offices of the South Western Gas Board.

In the afternoon the delegates had a choice of two activities, a sea cruise or a coach trip to Slapton Sands. Those



Before the Civic Reception the above photograph was taken. (From left to right) it shows Councillor R. W. Kellow (Deputy Mayor), Mrs. Kellow (the Deputy Mayoress), the Mayor of Torquay (Alderman A. E. Elson), the Mayoress (Mrs. Elson), The President (Dr. J. E. Arnold) and Mrs. Arnold

who thought that their sea legs were in order had a very enjoyable trip in bright, hot sun. The vessel, the *Bateau Morgat*, a converted French fishing boat, took the party from the harbour at Torquay into the English Channel along the Devon coast and up the River Dart. As the loudspeaker system had broken down, every so often a small brown sailor with a telescope could be seen pointing out landmarks to small groups of delegates. Because of the choppy nature of the sea on the return journey, many of the foreign guests came into intimate contact with the English Channel as waves broke over the bow.

The tour to Slapton Sands also enjoyed excellent weather and again an excellent Devonshire cream tea was partaken.

In the evening, in addition to the

theatre party, there was a further and unique function for an OCCA Conference, an organ recital by the President at the church of St. Matthias. Both were well attended and thoroughly enjoyed.

Friday 28 May

The morning saw the last of the Technical Sessions, chaired by Dr. W. F. Watson, Director of Research, Rubber and Plastics Research Association. At the conclusion of the session there were closing speeches by the President and the Honorary Research and Development Officer.

The Annual General Meeting of the Association was held at 2.15 p.m. and the proceedings are reported more fully elsewhere in this issue.

The final social event of the Conference was the Association's Dinner-Dance, in



Shown in the above photograph, which was taken at the reception before the Association's Dinner-Dance, are (from left to right) Dr. S. H. Bell (President Designate), Mrs. Bews, Mr. I. C. R. Bews (Honorary Secretary), Mrs. Sowerbutts, Mr. F. Sowerbutts (Honorary Treasurer), Mrs. Arnold, Dr. J. E. Arnold (President), the Deputy Mayoress (Mrs. Kellow), the Deputy Mayor (Councillor R. W. Kellow), Mr. D. S. Newton (Honorary Editor), Mr. A. T. S. Rudram (Honorary Research and Development Officer), Mrs. Hamblin and Mr. R. H. Hamblin (General Secretary)

the evening. Before the dinner the delegates were received by Dr. J. E. Arnold, the President, together with Mrs. Arnold, the Deputy Mayor of Torquay, Councillor Kellow, and the Deputy Mayoress. The company applauded the principal top table guests to their places in the traditional manner.

After the loyal toast had been proposed by Dr. J. E. Arnold, the toast to the Borough of Torquay was proposed by Dr. S. H. Bell (the President Designate), who in a very witty speech gave a number of amusing facts about the town in which the Conference had been held. He finally asked the Deputy Mayor to convey to the Mayor the Association's thanks for the hospitality that the borough had shown them at the Civic Reception.

In reply the Deputy Mayor conveyed the apologies of the Mayor for being

unable to be present at the banquet and said that he (the Mayor) wished the assembled company an enjoyable evening. He thanked Dr. Bell for the kind things he had said about Torquay and said that it had become clear that Dr. Bell knew more about Torquay than he did!

The toast to the Association was proposed by Mr. H. Meyer, the President of the Scandinavian Federation for Paint Technologists, who said that he was honoured to have been asked to propose this toast. The Scandinavian Federation was only 12½ years old and OCCA was nearly 50, and that just as children of 12 have their idols, so his Society looked up to OCCA as their idol. If OCCA had a fan club he was sure that the SLF would be enthusiastic members. He always enjoyed the quiet, friendly atmosphere that was present at OCCA

Conferences and also the high scientific level that was evident at this one. This Conference showed that OCCA was thinking of the future and that everybody could be proud of the Torquay Conference. In saying that the Association was combining the wisdom of old age with the energy of youth, he asked the company to rise and drink a toast to the Association.

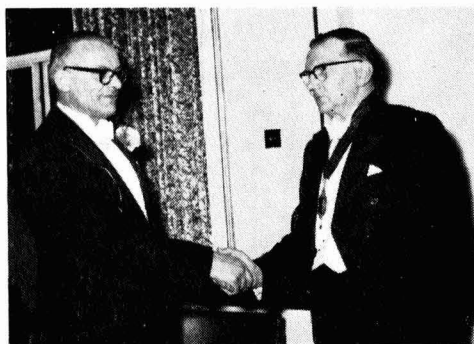
In reply, Dr. Arnold thanked Mr. Meyer for the kind things he had said about the Association and said that he considered it a great privilege to serve the Association as its President. He expressed his thanks to the Section Chairmen for the hospitality he had received when he had visited their Sections. He then paid tribute to the Honorary Officers for being towers of strength to him during his term of office. He complimented the Council on its wisdom in choosing Dr. Bell as the next

President, and wished him a happy and successful term of office. Turning to his wife, he thanked her for all the support she had given him during the period he was President. He thanked the General Secretary and the staff at Wax Chandlers' Hall, for he said that without their support the President's work would not be possible. Finally he expressed his thanks to his own personal secretary for the help she had given him while he was President.

Dr. H. W. Keenan (President 1944-47), on behalf of the Association, welcomed the guests and ladies, and said how pleased the Association was to see them there and hoped that they had an enjoyable time. Beside the Presidents of FATIPEC and SLF, there was present a representative from the FSPT, Mr. W. H. Hoback. The Association was delighted to welcome Mr. A. R. Penfold, an Honorary Member and first Chairman of the Australian Section, the petition for the formation of which was presented during Dr. Keenan's Presidency. He welcomed also the lecturers, the Chairmen of the Technical Sessions, the overseas visitors and the ladies. The President of FATIPEC, Dr. W. J. Nijveld, replied to this toast. He coupled his thanks with the comments of the SLF President, and also thanked Dr. Keenan for his very kind speech. He also wished to express his thanks on behalf of the guests to the



Dr. H. W. Keenan (President 1944-47) is shown here proposing the toast to the guests and ladies



The newly-elected President, Dr. S. H. Bell (right), is being congratulated on his appointment by his predecessor, Dr. J. E. Arnold, who has just presented him with the Presidential Insignia

whole staff for the organising work in connection with the Conference. He then asked everybody to rise and join him in a toast to "Friendship."

After the speeches, Dr. Bell, who had been elected President at the Annual General Meeting that afternoon, received the Insignia from Dr. Arnold, the retiring



In recognition of the help and support that she had given her husband during his Presidency, Dr. Bell presented Mrs. J. E. Arnold with a gift of a portable typewriter on behalf of the Association

President. When investing Dr. Bell with the Presidential Insignia, Dr. Arnold used the form of words first introduced by Dr. H. A. Hampton at the Scarborough conference.

Sydney Hector Bell, in accordance with the resolution passed at the Annual General Meeting this afternoon, it is now my duty to invest you with the Insignia as President of this Association and I charge you to guard well the interests of our Association and at all times to uphold the dignity of your high office.

Dr. Bell replied :

This is, for me, a proud moment. But it is also a moment when attention is called to our insignia.

OCCA deserves to have as fine an emblem as this ; and to each President, as he wears it, it must be an abiding challenge to worthy service.

Dr. Arnold, ladies and gentlemen—I will strive to be worthy of it.

Dr. Bell then presented Dr. Arnold with a Past President's medallion with the words:

I am about to present to you the badge which is a miniature of the Presidential Insignia and the proud possession of our Past-Presidents.

I hesitate to say just that you have outstandingly earned it for, whilst that is abundantly true, it does not begin to express the depth and essence of what I know to be your feelings, or ours.

To be President of the Oil and Colour Chemists' Association is an honour.

To be recognised as an outstandingly good President is a greater honour.

This badge symbolises the honour, and its presentation is a token of our awareness of your services to us all.

It ask you to accept it with our affection and appreciation.

He then presented Mrs. Arnold with a portable typewriter on behalf of the Association in recognition of the help and support that she had given her husband during the two years of his Presidency.

After dinner, dancing continued until 1 a.m. There was no cabaret this year, it having been decided that the Association should present each lady with a small gift—on this occasion, a silk scarf.

During the dance the tournament prizes were distributed by Mrs. Arnold at the request of Dr. Bell. The winners were as follows :

Tennis : R. Blakey, Miss A. Cooney.

Table Tennis : K. Partington, Mrs. A. C. W. Jones.

Golf : The winner of the Sam Sharp Conference Trophy was Mr. R. D. Calvert, Chairman of Midlands Section.

Saturday 29 May

After breakfast the Conference dispersed, and from comments received it would appear that this was one of the most successful Association Conferences held.

G.R.H.

OCCA Biennial Conference 1967

Following the considerable success of the 1965 Torquay Conference, an account of which can be found above in this issue, Council has decided that the 1967 Conference will return to Scarborough, the venue for the 1963 Conference. The Conference, which will take place from

20 to 24 June 1967, will have its headquarters at the Grand Hotel, with the overflow at the St. Nicholas Hotel, situated just across the square from the Grand, as in 1963.

The theme of the Conference has yet to be decided, but further details will appear from time to time in this *Journal*.

OCCA 18

OCCA Eighteenth Technical Exhibition, 1966

As announced in the July issue of the *Journal*, OCCA 18 (the Eighteenth Technical Exhibition) will take place at Alexandra Palace, London, on the following dates and times :

Monday 14 March	3.00 p.m.-6.30 p.m.
Tuesday 15 March	10.00 a.m.-6.00 p.m.
Wednesday	
16 March	10.00 a.m.-6.00 p.m.
Thursday 17 March	10.00 a.m.-6.00 p.m.
Friday 18 March	10.00 a.m.-4.00 p.m.

Forms for application for stand space were despatched to companies at the end of June, and a large number of completed forms have already been returned. Those companies intending to exhibit must send in their completed forms of application not later than **Friday 3 September 1965**.

There will be an Exhibition Luncheon at the Savoy Hotel, London, on Monday 14 March. The forms of application for tickets for the Luncheon will be included in each copy of the *Official Guide*, which will be sent to all members of the Association early in 1966. The *Official Guide* will also be sent, as far as possible, to all consuming firms in Britain and individually to chemists and technologists in the paint and allied industries in Western Europe. They can also be obtained by visitors to the Exhibition without charge; admission to the Exhibition will also be free.

It is believed that the Exhibition is unique in that it is entirely a technical one, aimed at ensuring that technical advances are passed on as quickly as possible to the technical personnel within the paint, printing ink, linoleum and allied industries. The technical advances may relate to new products, new knowledge of existing products, and their uses, or, in suitable cases, existing knowledge which has not been available to the consuming industries.

The standard shell scheme for the 1966 Exhibition will include felt covering to the facias, which will be trimmed with British Columbian pine; the colour of the felt in the north-south corridors will be fuchsia and, in the east-west corridors, saffron. The standard shell scheme wall and floor covering, both of which may be altered by exhibitors, will be in grey. The standard fascia name plaques will be painted in black letters on a white background.

The Exhibition is not confined solely to British firms and continental companies wishing to be considered for stand space, and any companies in the United Kingdom who have not previously exhibited and who would like to have their names submitted to the Committee for consideration should write to R. H. Hamblin, General Secretary, Oil and Colour Chemists' Association, Wax Chandlers' Hall, Gresham Street, London, E.C.2 (MONarch 1439, Ext. 3).

Bristol Section

Annual General Meeting

At the 21st Annual General Meeting, held at the Hawthorns Hotel, Bristol, on Friday 30 April 1965, at 7.15 p.m., the Section was delighted to have as its guests the President of the Association, Dr. J. E. Arnold, and the General Secretary, Mr. R. H. Hamblin. Members present were very pleased to include in their number several past Chairmen of the Section, who had held office during its first 21 years.

The following officers were elected for the coming session :

Chairman Mr. R. J. Woodbridge.

Hon. Secretary Mr. D. N. Fidler.

Hon. Treasurer Mr. W. J. McWaters.

Hon. Publications Secretary and Research and Liaison Officer

Mr. L. Tasker.

Representative on Council

Mr. L. J. Brooke.

Hon. Auditor

Mr. C. C. Pearce.

Committee Members

Mr. N. T. Butler, Mr. R. A. Davis,
Mr. F. E. Ruddick.

As this was the 21st Annual General Meeting and specially to mark the occasion the business of the meeting was followed by a dinner. Following the dinner, speeches from the retiring Chairman, Mr. L. J. Brooke, from Dr. Arnold, who congratulated the Section on attaining its majority, from Mr. W. G. Wade, first Chairman, and from Mr. R. J. Woodbridge, all echoed the jovial spirit of the gathering and underlined the friendly atmosphere of the Section, and it was with great reluctance that the activities of the evening were brought to a close.

L.T.

New South Wales

Past Chairmen's dinner

The Annual Past Chairmen's Dinner of the Section was held at "Vonroe," Ashfield, on Tuesday 4 May. Twelve past Chairmen were able to attend this annual event and ten members of the present Committee were the hosts for the evening.

The toast to OCCA was proposed by Mr. K. Ellis who recalled some of the history of the Association and said that as members of an organisation we gain what we put into it.

The Section Chairman, Mr. M. Leahey, discussed some of the more important activities and problems of the present Committee.

In the ensuing informal discussion, the Past Chairmen expressed their opinions on

the Section's activities and the future policy for the benefit of the present Committee members.

The Past Chairmen's Dinner is regarded as a "Parliament of Senior Statesmen" of the Section and their views are usually considered to be of great assistance to the current Committees.

Wine-tasting evening

A wine-tasting evening was held by the Section, at Weinkeller, Sydney, on Tuesday 25 May. The Social Convenor, Mr. L. Richardson, introduced the members of Wine and Brandy Producers Association of NSW who supplied the wines for the evening and gave short talks on various types available for different occasions.

During a very enjoyable dinner members and guests were able to com-

pare relative merits of various wines produced in Australia. As far as is known all bottles passed very rigorous specification tests, and no rejected "off grade" batches were left at the conclusion of the evening.

This evening proved to be a very popular social event of the year with over 120 members, their wives and guests attending.

A. A.

West Riding Section

Annual works visit

The annual works visit of the West Riding Section was to the Speke Works of the Dunlop Rubber Co., on 18. May. Despite a very poor turn-out by Section members, possibly due to the nearness of the OCCA Conference, we were cordially welcomed by the Public Relations officer, Mr. Ellis, who explained the range of activities undertaken at the Speke Works. These cover the Automobile and Giant Tyre Division, the Belting Division, and the Dunlop Sports Company, the latter being concerned solely with the making of golf balls.

The guests were then introduced to

Mr. Wright of the Technical Department, who was their guide through the Sports Company and Auto Tyre division. It was an advantage to be a small party, and so questioned the guide on many details and as a result were too short of time to see the Belting Division and the Giant Tyres.

To round off the visit Mr. Kennedy, the Technical Service Manager, joined the party for a question session over afternoon tea and after expressing thanks for their hospitality the party left at approximately 5 p.m.

J. N. MCK.

A new edition of the Surface Coating Resin Index

A new edition of the Surface Coating Resin Index which supersedes the one published in 1962, has been compiled jointly by the Surface Coating synthetic Resin Manufacturers' Association and the British Plastics Federation.

The preface has been printed in French, Italian, German and Spanish, as well as in English. This Index lists many new products which have become

available since the 1962 publication and nearly 1,500 British-made synthetic resins used in surface coating applications have been classified under 21 headings according to type, on the basis of data supplied by the manufacturers. There is also an index of trade names and a list of manufacturers with their addresses.

Copies may be obtained from the Secretary of the Surface Coatings Synthetic Resin Manufacturers, Association 3, The Grove, Ratton, Eastbourne, Sussex, at a cost of 10s. each (post free).

Section programmes for 1965-66 session

Bristol

Meetings will be held at the Royal Hotel, Bristol, at 7.15 p.m. unless otherwise stated.
Overall theme : Colour and Pigmentation.

1965

Friday 24 September

Chairman's Address.

Friday 29 October

"Light Fastness and Weathering Fastness of Coloured Pigments," by Mr. I. S. Moll.

Thursday 4 November

"Design of a Modern Paint Factory." Open Discussion. Joint Meeting with Birmingham PVL Club, at the Imperial Hotel, Birmingham.

Friday 26 November

"Colour Experiments and the Land Process," by Mr. D. F. Gibbs, University of Bristol, at the H. H. Wills Physics Laboratory.

Irish Branch

Unless otherwise stated all meetings will be held at The Dolphin Hotel, Essex Street, Dublin, at 8 p.m.

1965

Friday 24 September

"Developments in Metal Pre-treatment," by Mr. R. E. Shaw.

Friday 29 October

"Interesting Aspects in Emulsion Paints," by Dr. P. M. Troll.

Friday 26 November

"Printability of Paper and Board," by Miss E. J. Pritchard, The Printing, Packaging and Allied Trades Research Association.

Thursday 9 December

Annual Dinner and Dance—South County Hotel.

1966

Friday 7 January

"Coloured Pigmentation for Electrodeposition." by Mr. J. R. Taylor and Mr. L. Tasker.

Friday 28 January

"Crystal Form and Particle Size of Organic Pigments in Printing Inks and Paints." by Dr. Gerstner.

Friday 25 February

"Defective Colour Vision," by Mr. K. McLaren.

Friday 25 March

"Outdoor Exposure Results with Titanium Pigments," by Dr. Epple and Dr. Wagener.

Friday 29 April

Annual General Meeting, followed by "Colour Photography as a Recording Medium."

1966

Friday 28 January

"Plasterboard its Manufacture and Uses," by A. Brioscu.

Wednesday 9 February

3 p.m. Works visit to Messrs. Unidare Ltd.

Friday 25 February

Social Evening—Details to be announced later.

Friday 25 March

7.30 p.m. Annual General Meeting. 8 p.m. "Design and Decoration in Modern Architecture." by Mr. P. N. Linahan.

Hull

All Meetings to commence at 7 p.m.

1965

Monday 13 September

Discussion Evening, mainly for younger members. 7.00 p.m. at the Queens Hotel, Hull.

Monday 4 October

"Development in Media for Paints and Printing Inks," by Mr. G. Hutchinson.

Friday 8 October

Annual Dinner-Dance, New York Hotel, Hull.

Monday 1 November

"The Protection of Structures," by Mr. F. G. Dunkley.

Monday 6 December

"The Glyceride Composition of Cottonseed Oils," by Dr. M. L. Meara. (Joint Meeting with SCI Oils and Fats Group.)

1966

Monday 3 January

"Recent Development in Water-Based Resins," by Dr. H. Warson.

Friday 14 January

Chairman's New Year Party. Time and venue to be decided.

Monday 7 February

"Resins from Cyclic Ketones," by Mr. V. F. Jenkins.

Thursday 17 February

Discussion Evening mainly for younger members. 7 p.m. at the Queens Hotel, Hull.

Monday 7 March

"The Evaluation of the Optical Properties of Titanium Dioxide Pigments," by Mr. F. D. Robinson.

London

Unless otherwise stated, meetings will be held in the Small Physics Lecture Theatre, Imperial College of Science and Technology, South Kensington, London, S.W.7. Refreshments will be available from 6.15 p.m. and Lectures will commence at 7.00 p.m.

Please note change of venue

1965

Thursday 16 September

Chairman's Evening. "The Decoration of Plastics," by Mr. C. R. Pye.

Wednesday 20 October

EUROPEAN CO-OPERATION LECTURE—DENMARK. "Rheological Properties of Paint and two new Instruments for Measuring them," by Mr. P. Fink-Jensen.

Thursday 11 November

"Airless Spray Painting," by Mr. F. G. Dunkley (British Railways).

Friday 19 November

Ladies' Night at the Criterion in Piccadilly, London, W.1.

Wednesday 8 December

"The Use of Computers in Process Control," by Mr. T. B. M. Rybak.

1966**Monday 10 January**

Joint Meeting with Society of Chemical Industry, Colloid and Surface Chemistry Group at 14 Belgrave Square, S.W.1. "Surface Properties of Titanium Dioxide Pigments," by Mrs. S. M. Rybicka and Mr. A. F. Sherwood (The Paint Research Station).

Wednesday 16 February

"Recent Advances in the Chemistry of

Southern Branch

All meetings will start at 7.30 p.m.

1965**Wednesday 22 September**

"Organotins as biologically active compounds for the paint industry" by Mr. R. F. Bennett at the Polygon Hotel, Southampton.

Monday 11 October

"Developments in inorganic pigments" by Dr. P. Kresse at the Queen's Hotel, Southsea.

Wednesday 24 November

"Elastomeric sealants" by K. Beaumont at the Polygon Hotel, Southampton.

Thursday 9 December

"Decorating plastics" by Mr. S. E. Francis at the Chemistry Department Lecture Theatre, Southampton University (Joint meeting with the Southern Section of the Plastics Institute).

Thames Valley Branch

All meetings will be held at the Royal White Hart Hotel, Beaconsfield, Bucks

1965**Wednesday 29 September**

"Recruitment, Training and Career Development," by J. S. Read.

Thursday 21 October

"Strip Coating of Steel," by F. Cooke.

Tuesday 16 November

"Costing and Accounting in the Paint Industry," by F. J. K. Hillebrandt.

"Unsaturated Acids," by Dr. M. F. Ansel (Queen Mary College, University of London).

Thursday 24 March

"Adhesion as a Factor in the Performance of Solvent-free Coatings," by Mr. E. W. Garnish and Mr. P. T. Brown.

Thursday 21 April

Annual General Meeting at the Criterion in Piccadilly.

1966**Monday 10 January**

"Corrosion mechanisms and prevention" by Dr. G. Butler at the Queen's Hotel, Southsea.

Monday 14 February

"Zinc/Silicate paints" by Mr. M. J. F. Meason at the Queen's Hotel, Southsea.

Wednesday 9 March

"Colour photography" by Mr. R. G. Barber at the Polygon Hotel, Southampton.

Monday 11 April

Annual General Meeting.

Thursday 9 December

"Aerosols," by W. H. Brown.

1966**Thursday 20 January**

"International Paint Test Methods," by T. R. Bullett.

Thursday 24 February

"Looking Back," by Dr. H. A. Hampton.

Wednesday 30 March

"Vivid Lightfast Pigments," by a

speaker from the Harmon Division of Allied Chemicals Corporation.

Thursday 14 April
Annual General Meeting.

A buffet dance will be held during the second half of the session. Date and venue to be announced later.

Manchester

1965

Friday 17 September

Works Visit—ICI Ltd., Petrochemical and Polymer Laboratories, Runcorn Heath, Cheshire.

Friday 8 October

“New Developments in Carbon Black Technology in relation to Pigment Application,” by N. Scott, at the Manchester Literary and Philosophical Society, George Street, Manchester, at 6.20 p.m.

Friday 22 October

Annual Dinner and Dance, at the Midland Hotel, Manchester.

Friday 29 October

Works visit to H. J. Heinz Co. Ltd., Wigan.

Friday 12 November

“The Printing and Decorating of Tinplate,” by A. D. Lott, at the Constitutional Club, Tithebarn Street, Liverpool, at 6.30 p.m.

Friday 10 December

“Powder Technology,” by J. C. Williams, at the Manchester Literary and Philosophical Society, at 6.30 p.m.

1966

Friday 14 January

“Market Research, A Science or a ‘Craft’?”, by J. P. Phoenix, at the Manchester Literary and Philosophical Society, at 6.30 p.m.

Friday 11 February

“On the Reliability of Exposure Trials,” by Dr. Wagener, at the Manchester Literary and Philosophical Society, at 6.30 p.m.

Friday 11 March

“Modern Developments in Industrial Surface Coatings,” by F. Armitage, at the Strand Hotel, Brunswick Street, Liverpool.

Friday 15 April

Annual General Meeting, at 6.30 p.m. Venue to be arranged.

Midlands

Meetings are at Chamber of Commerce House, 75, Harborne Road, Birmingham, 15 and commence at 6.30 p.m. except the October and April meetings which will commence at 7.00 p.m.

1965

Friday 17 September

“To automate . . . ? To speculate . . . ?” by H. R. Touchin.

Friday 15 October

“Advertising,” by G. S. Worrall, at BIP Chemicals Ltd., Oldbury.

Friday 19 November

“Paint Additives,” by Dr. G. A. Wolstenholme.

1966

Thursday 6 January

Ladies' Night at the George Hotel, Solihull at 7 p.m.

Friday 21 January

“Thermosetting Acrylic Resins,” by J. R. Taylor.

Friday 18 February

“International Test Methods” by T. R. Bullett.

Trent Valley Branch**1965****Thursday 7 October**

“New Developments in Carbon Black Technology in relation to Pigmenting Applications,” by N. Scott.

Thursday 11 November

“Atoms and Ions,” by T. Fullwood.

During the 1965-6 Session there will be a works visit some time in May 1965 to the Sutton-in-Ashfield works of the Metal Box Co. Ltd.

Newcastle

Meetings are held in the Royal Turk's Head Hotel, Grey Street, Newcastle upon Tyne, and commence at 6.30 p.m. unless otherwise stated.

1965**Thursday 14 October**

Afternoon : Visit to the Central Laboratories of British Titan Products, at Billingham.

Evening : “The Use of Microscopy in the Investigation of Paint Defects and Failures,” by Mr. H. Wells.

Tuesday 26 October

Joint Meeting with the National Federation of Master Painters and Decorators, in the Crown Hotel, Newcastle, at 7.30 p.m. (*Please note venue.*)

Thursday 4 November

“Pretreatment Primers for Structural Steel,” by Mr. D. A. Bayliss and Mr. D. C. Wall.

Friday 25 March

Newton Friend Lecture, “Robert Boyle and his Experiments Touching Colour,” by G. A. Campbell.

Friday 22 April

Annual General Meeting. Venue to be arranged.

1966**Thursday 13 January**

“The Impact of Plastics on the Paint Industry,” by Dr. H. W. Keenan.

Thursday 24 February

“Adhesion and Adhesives,” by J. S. Moxham.

Thursday 7 April

Annual General Meeting.

Thursday 2 December

“Car Finishes : Present Position and Future Trends,” by Mr. G. Hind.

1966**Thursday 6 January**

“Costing in the Paint Industry,” by Mr. P. R. Rodger.

Thursday 3 February

“Some Recent Thoughts on Paint Evaluation,” by Dr. C. A. Chaplin.

Thursday 3 March

“To Automate? . . . To Speculate?” by Mr. H. R. Touchin.

Thursday 7 April

Annual General Meeting.

Scottish

All Technical Meetings will be held at More's Hotel, India Street, Glasgow

1965

Thursday 14 October

"Aerosols in the Paint Industry," by Mr. D. Thomas.

Thursday 11 November

"Painting an Imp," by Mr. J. Lauder.

Thursday 9 December

"The Place of Computers in the Paint Industry," by Mr. T. Henegan.

Eastern Branch

All Meetings to be held in the North British Hotel, Princes Street, Edinburgh, at 7.30 p.m. unless otherwise stated :

1965

Saturday 2 October

Student Group Meeting, Lunch and Skittles match, details to be announced later.

Wednesday 27 October

"General Principles of Surface Activity and Surfactants," by C. D. Moore.

Wednesday 24 November

"Colour," by C. T. Donaldson.

Wednesday 15 December

"Advantages of Epoxy Marine Paints," by A. McIntosh.

1966

Thursday 13 January

"Micronised Pigments in Paint Manufacture," by Mr. W. G. Wade.

Thursday 10 February

"The Railway Scientist," by Mr. R. Wood

Thursday 10 March

"The Manufacture of Carbon Black Pigment and Dispersions," by Mr. L. Venuto.

1966

Wednesday 26 January

"Micronized Pigments in Paint Manufacture," by W. G. Wade.

Wednesday, 23 February

"International Test Methods for Paints," by T. R. Bullett.

Wednesday 23 March

AGM 7.0 p.m. followed by lecture "Protection of Structures," by F. G. Dunkley.

Wednesday 20 April

"Resins from Cyclic Ketones," by V. F. Jenkins.

West Riding

Technical Meetings will be held at the Great Northern Hotel, Leeds, commencing at 7.30 p.m.

1965

Tuesday 14 September

"Two Component Paints," by Mr. A. McWilliam.

Tuesday 12 October

"The Practice of Colour," by Miss A. Rathbone.

Tuesday 9 November

“Trichlorethylene Paints,” by I. M. Cairncross.

Friday 26 November

Annual Dinner-Dance, at the Granby Hotel, Harrogate.

Tuesday 7 December

“Advertising — Salesmanship Magnified,” by Mr. J. C. Wells.

1966

Tuesday 11 January

“Water Based-Metal Powder Pigmented Paints,” by Dr. Troll.

Tuesday 8 February

“Oleochemicals,” by Mr. K. E. Wright, Joint lecture with SCI Oils and Fats Group.

Tuesday 8 March

“The Exploitation of New Methods of Paint Application, the Examination of their Potential Advantages and the Development of Paints Designed to Exploit Them,” by Mr. F. G. Dunkley.

Tuesday 12 April

Annual General Meeting.

Register of Members

The following elections to membership have been approved by Council. The Sections to which the new members are attached are given in italics.

Ordinary Members

BRETT, GEOFFREY JOHNSON, 34 Ravenscourt Drive, Hornchurch, Essex. (*London*)

FARRANT, CLIFFORD HENDRIE, 125 Cressex Road, High Wycombe, Bucks. (*London*)

FAULDNER, RAYMOND NOEL, B.SC., A.R.I.C., 6 Osborne Close, Hanworth, Middlesex. (*London*)

LAL, PRABHAKAR ANNARAO, B.SC., Pathak Nivas, Swami Shradhanand Road, Dombiwali (East) Dist : Thana Maharashtra State, India. (*Overseas*)

LEDGER, WARREN ALBERT, B.SC., L.R.I.C., “Enaneo,” Stock Lane, Wilmington, Dartford, Kent. (*London*)

LONG, RICHARD ARTHUR JOHN, B.SC., PH.D., 24 Peartree Road, Dibden Purlibu Hythe, Hants. (*London*)

LYTHGOE, ALAN LENNOX, B.SC., 38A Fairdene Road, Coulsdon, Surrey. (*London*)

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LOWE, FRANK WILLIAM, 72 Princes Road, Teddington, Middlesex. (*London*)

Junior Members

BUTLER, DENIS ERIC, 19 Fielding Avenue, Twickenham, Middlesex. (*London*)

Forthcoming Events

Details are given of meetings in the United Kingdom up to the end of the month following publication, and in South Africa and the Commonwealth up to the end of the second month after publication.

Saturday 11 September

Scottish Section—Junior Group. Film Show.

Monday 13 September

Hull Section. Discussion Evening, mainly for younger members at the Queens Hotel, Hull, at 7 p.m.

Western Australian Section. "Automotive Finishes," by Mr. P. Dalla Riva, Balm Paints Pty. Ltd.

Tuesday 14 September

West Riding Section. "Two Component Paints," by Mr. A. McWilliam, England Hughes & Bell Ltd., at Great Northern Hotel, Leeds, at 7.30 p.m.

Thursday 16 September

London Section. Chairman's Evening. "The Decoration of Plastics," by Mr. C. R. Pye, at the Small Physics Lecture Theatre, Imperial College of Science and Technology, South Kensington, London, S.W.7., at 7 p.m.

Friday 17 September

Manchester Section. Works Visit—ICI Ltd., Petrochemical and Polymer Laboratories, Runcorn Heath, Cheshire.

Midland Section. "To Automate . . . ? To Speculate . . . ?", by Mr. H. R. Touchin, at Chamber of Commerce House, 75 Harborne Road, Birmingham, 15, at 6.30 p.m.

Friday 24 September

Bristol Section. Chairman's Address, at Royal Hotel, Bristol, at 7.15 p.m.

Bristol Section—Irish Branch. "Developments in Metal Pretreatment," by Mr. R. E. Shaw, B.Sc., F.I.M., Paints Division, ICI Ltd., at The Dolphin Hotel, Essex Street, Dublin, at 8 p.m.

Wednesday 29 September

London Section—Thames Valley Branch "Recruitment, Training and Career Development," by Mr. J. S. Read, Shell Chemical Co.

Oil and Colour Chemists' Association

President : S. H. BELL, PH.D., D.I.C., A.R.C.S., F.R.I.C.

The Oil and Colour Chemists' Association was formed in 1918, to cover paint, printing inks, pigments, varnishes, drying and essential oils, resins, lacquers, soaps, linoleum and treated fabrics, and the plant, apparatus and raw materials used in their manufacture. In 1923 it absorbed the Paint and Varnish Society. The stated purpose of the Association is to promote by discussion and scientific investigation the technology of the industries concerned with the above-mentioned products, and to afford members opportunity for the interchange of ideas. This is achieved by the regular holding of ordinary meetings at which papers are presented, and the organisation of annual technical exhibitions, biennial conferences, educational activities and practical co-operative experimental work. Details of these activities are given in the *Journal of the Oil and Colour Chemists' Association*, which is published monthly, and whose pages are open to receive communications and other pronouncements on scientific and technical matters affecting the members of the Association and the industries concerned. The Association's meetings also afford opportunities for members to meet informally and socially.

There are Sections of OCCA in Auckland, Bristol (with an Irish Branch), Hull, London (with Southern and Thames Valley Branches), Manchester, the Midlands (with a Trent Valley Branch), Newcastle upon Tyne, New South Wales, Queensland, Scotland (with an Eastern Branch), South Africa (with Branches in the Cape, Transvaal and Natal), South Australia, Victoria, Wellington, West Australia and the West Riding, and these are responsible for the conduct of their own local affairs. There is also a General Overseas Section. There is also a close alliance between the Association, the Federation of Societies for Paint Technology in the United States, and the Fédération d'Associations des Techniciens de l'Industrie des Peintures, Vernis, Emaux et Encres d'Imprimerie de l'Europe Continentale (FATIPEC). The Association also maintains cordial relations with the Scandinavian Federation of Paint and Varnish Technicians (SLF).

Ordinary Membership is granted to scientifically trained persons, and Associate Membership to others interested in the industries covered. Junior Membership, which is intended primarily for students, is open without restriction to persons under the age of 21 and to those up to 25 who are following a course of technical study. The annual subscription in each case is three guineas, except for Junior Members whose subscription is 10s. 6d. An entrance fee of 10s. is payable by all members. Applications for membership are invited from suitably qualified persons who are engaged or otherwise interested in the industries noted above. Applications, which should be supported by two members of the Association (one of whom must be an Ordinary Member) should be forwarded to the General Secretary at the address given below. Application forms and full details of membership may be obtained from the offices of the Association.

PUBLICATIONS

Journal of the Oil and Colour Chemists' Association, Published monthly. Subscription rate to non-members in UK and abroad, £7 10s. p.a. post free ; payable in advance.

An Introduction to Paint Technology (Second Edition). Pp. 187, illustrated, with index, 15s. (including postage).

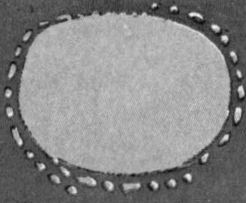
Paint Technology Manuals

Part 1 : " Non-convertible Coatings," Pp. 326, 35s.

Part 2 : " Solvents, Oils, Resins and Driers," Pp. 239, 35s.

Part 3 : " Convertible Coatings," Pp. 318, 35s.

General Secretary : R. H. Hamblin, M.A., F.C.I.S., F.C.C.S., Wax Chandlers' Hall, Gresham Street, London, E.C.2.



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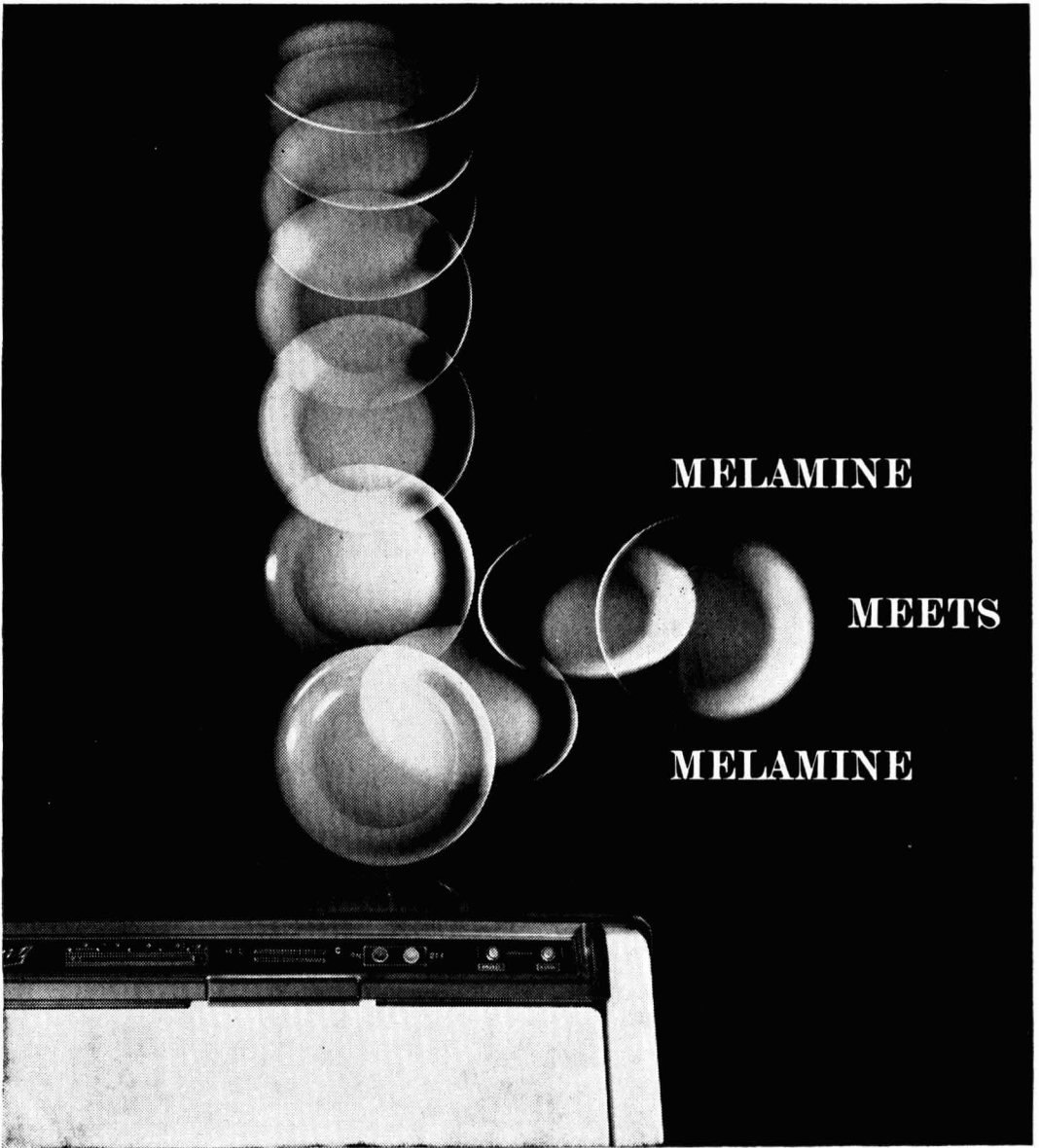
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