PAUL JOSE DE MAYO

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Paul de Mayo was born in London, the only son of Nissim and Anna de Mayo, who were originally members of the Sephardic Jewish community of Salonika (now Thessalonike). They emigrated to England in 1919 with their three-year-old daughter, Flora, to escape the civil disturbances that preceded the cession of Salonika from Turkey to Greece. Anna de Mayo's grandfather had been born in Gibraltar, and this British connection inclined the family to seek permanent refuge in England rather than in France, where other parts of the family had gone. Once settled in London, Nissim established a business as an importer of plant materials, especially of those reputed to have medicinal properties.

In this family of quietly prosperous immigrants, the language spoken at home until Nissim's death (at 52) in 1935, was Ladino, a mixture of old Castilian Spanish and Hebrew. Anna, educated at a French-speaking school in Salonika, knew no English when she arrived in London; although she subsequently learned to speak fluent, albeit distinctly accented, English, she preferred French. Her conversations with Paul often consisted of French on her part and English on his. Years later, he explained that his failure to learn French at this stage was due to his mother's discouraging amusement at his attempts at French pronunciation.

Anna de Mayo was not unduly worried about Paul's French because her first concern was that he should get a good English education. To this end, he was enrolled at an early age in the Preparatory School for University College School (UCS) in Hampstead. This was followed by UCS itself until just before World War II, when the family moved to Devon, where Paul completed his secondary education at Teignmouth Grammar School. He then attended the University College of the Southwest of England in Exeter to study for a University of London external BSc degree in chemistry. His performance was satisfactory by many standards—an upper second in 1944—but in no way foreshadowed anything

exceptional academically. With World War II still going on, Paul's choice of employment after graduation was limited to the chemical industry or the army. With the usual military training of a wartime undergraduate behind him, Paul was convinced that he was not designed to be a soldier. He soon found himself at Organon, where he met a young laboratory assistant, Mary Yvonne Turnbull, daughter of Donald Llewellyn and Edna (*née* Riches) Turnbull, whom he married in 1949.

The stint at Organon was followed by an interval at Pal Chemicals in Reading, when Paul decided to further his studies in chemistry and began work at Birkbeck College, where it was possible to take a part-time MSc by working at night. He moved from Pal Chemicals to the Pathology Laboratory at University College Hospital, situated near Birkbeck. There he published (in 1951) his first two papers, the first (with W. Rigby) on lithium aluminium hydride reductions (1)* arising from his MSc work, and the second on microelectrophoresis of protein on filter paper (2) from work at the hospital (with F.V. Flynn). In later years he was inclined to dismiss this second paper as scientifically limited, and in a personal memoir written shortly before his death (52) he noted the irony that this paper had 'exceeded in reprint requests any other publication obtained since'.

Meanwhile, at Birkbeck, change was in the air. In Paul's words (52): 'Then, a great wind blew through Birkbeck; a young firebird was coming from Imperial College via Harvard. Dr D.H.R. Barton had arrived.' Barton (later Sir Derek; F.R.S. 1954) had returned to the UK from his one-year sojourn at Harvard where he conceived the principles of conformational analysis that were to earn him the Nobel Prize nineteen years later. His associates at the time were privileged, as never thereafter, to share his working hours with few outside distractions. Water baths steamed for twelve hours on weekdays and well into the afternoon on Saturdays. Paul, now seeking a PhD, was one of three graduate students who formed the resident element in a group becoming increasingly international with a stream of postdoctoral workers from foreign lands. He knew, after the frustrating preceding years, that he had found what had eluded him. The range of researches covered in his PhD thesis bears ample witness to Paul's industry and productivity in those early years. This is even more remarkable than it might appear, for, by his own admission, he did not enjoy work at the bench as much as some of his colleagues.

When Barton was appointed to the Regius Chair at Glasgow, the house move was accomplished in record time and within the month steam baths were steaming in the new location at full tilt. Paul was appointed to a lectureship and there followed a brief two years before the group moved south again, to Imperial College. The work of these years laid a firm foundation for Paul's future in chemistry. The brief Glasgow period was most notable for the advent of photochemistry in the Barton group's research activities, with Paul providing a major driving force. When the Barton group departed, as it had arrived two years earlier, in a cloud of dust, Paul moved with them to Imperial College. He had in that brief space of time moved from being an outstanding graduate student to the next stage of a distinguished future career. After a year at Imperial College, in which he vigorously tackled research and writing in photochemistry and natural products, Paul took leave for a postdoctoral fellowship with R.B. Woodward at Harvard. In a small laboratory shared with Shô Itô from Sendai, Japan, he resumed, for the last time, full-time experimental work.

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* Numbers in this form refer to the bibliography at the end of the text.

While at Harvard, Paul was scouted by F.L.M. Pattison, the incoming head of the Chemistry Department of the University of Western Ontario (familiarly known as 'Western') in London, Ontario, Canada. Most of the established Canadian universities were at that time in the process of transforming from essentially undergraduate institutions to full universities with a broad range of graduate programmes, and Western, in particular, was actively seeking new faculty members to initiate a vigorous programme of research in organic and inorganic chemistry. The inorganic component of the plan was to be D.C. Bradley (F.R.S. 1980), then at Birkbeck College. He and Paul were well acquainted and by the autumn of 1959 Bradley and de Mayo were established in London, Canada.

The plan was a success. The two new professors applied themselves with great energy, and within a short time a dedicated group of postdoctoral fellows, graduate students and undergraduates were enthusiastically producing a stream of first-class research papers. Nor did this activity diminish when, in 1965, Bradley returned to England to take up the Chair of Inorganic Chemistry at Queen Mary College. A worthy successor was found in H.C. Clark, an inorganic chemist from New Zealand by way of the University of British Columbia, and the development of Western's Chemistry Department continued unabated. In 1969, Clark, by then head of the department, enlisted Paul's collaboration to set up the Photochemistry Unit, with Paul as the first director. A grant of about a million dollars from the National Research Council of Canada made it possible for the new unit to buy equipment, make some important new appointments and proceed to make a permanent name for itself as an internationally respected centre for the study of photochemistry.

Coinciding with these events were the birth of the de Mayos' two children, Ann Gabrielle and Philip Nicholas. At the same time Paul's scientific reputation was growing both in Canada and abroad. In 1966 he had received the Merck, Sharp and Dohme Lecture Award of the Chemical Institute of Canada. He was awarded the Centennial Medal of the Government of Canada in 1967, and was elected to the Royal Society of Canada in 1971. In 1975 he was elected a Fellow of the Royal Society. The Chemical Institute of Canada presented him in 1982 with its highest award, the Chemical Institute of Canada Medal, then in 1985 with the first E.W.R. Steacie Award in Photochemistry and in 1992 with the E.W.R. Steacie Award in Chemistry.

He served a term on the editorial board of *Canadian Journal of Chemistry*, and for an extended period on the boards of *Molecular Photochemistry, Nouveau Journal de Chimie, Tetrahedron* and *Tetrahedron Letters*. The October 1984 issue of *Canadian Journal of Chemistry* was dedicated to him on the occasion of his sixtieth birthday and was entirely devoted to papers by his friends, colleagues, former students and postdoctoral workers. When he retired, the photochemistry part of the *Journal of Photochemistry and Photobiology*, volume 91 (1991), was similarly dedicated in his honour.

In the early 1960s Paul decided to revive his latent knowledge of French, and, after a brief summer school in Quebec, rapidly became fluent. Buoyed by success he enlisted the assistance of a Spanish postdoctoral fellow in his group, Dr Rafael Suau, and acquired a serviceable knowledge of Spanish; later, before ill health began to curtail his activities, he took up Japanese. His mastery of French was used in a series of short study leaves in France starting in 1966, either at the Institut de Chimie des Substances Naturelles in Gif-sur-Yvette, or, more often, at the Université Paris-Sud in nearby Orsay. At one point he seriously considered the possibility of a professorship in France and obtained a Docteur ès Sciences degree from Paris-Sud.

The last twenty years of his life were marked by deteriorating health. In 1972, while on a study leave at Aarhus in Denmark, he experienced signs of angina. The spectre of his father's untimely death from heart disease was always before him and he began an extended treatment with chemotherapy. By 1979 it was evident that his only hope for survival lay in a heart bypass operation. He was not strong, however, and two heart stoppages during the operation left him almost incapacitated. An extended interval in a wheelchair was followed by a period in which he could walk with the aid of two canes. Parkinson's disease further disabled him to the point that in the final year of his life his handwriting was almost illegible. In 1993 he broke a leg; the leg failed to heal and required amputation. On 26 July 1994, less than two weeks before his seventieth birthday, he died quietly in his wheelchair.

SCIENTIFIC CONTRIBUTIONS

Paul's fascination with the structures of natural products had its origin in his PhD studies with Barton, at a time when complex structures were established almost entirely by chemical means. Instrumental analysis was confined to ultraviolet (UV) and infrared (IR) spectroscopy, the mass spectrometer was being added (see below), whereas nuclear magnetic resonance (NMR) was still a distant prospect. Parts 13 to 16 (3–6) of Barton's notable 29-part series on triterpenoids formed a substantial part of Paul's PhD thesis. Icterogenin (1) (5) exemplifies
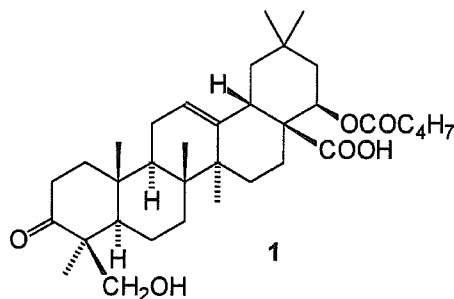
the complexities of the structures studied. Two sesquiterpenoids, tenulin (a perhydroazulene) (7) and pyrethrosin (a cyclodecene derivative) (9), are also from this period. Pyrethrosin was of unusual significance, because attempts to acetylate it led to a perhydronaphthalene cyclopyrethrosin acet-ate; this suggested, prophetically, that 'by estab-lishing different bonds across the 10-membered ring, it is possible to construct the carbon skeletons of most of the bicyclic sesquiterpen-oids'. Paul's intellectual contribution to the researches that furnish his PhD thesis was substantial, and when the time came, he had probably amassed more significant results than might have been required to satisfy even his specially selected PhD examiner, Sir Alexander Todd (later Lord Todd), F.R.S.

A watershed event occurred towards the end of the Birkbeck days. This was Robertson and Sim's determination in Glasgow of the structure of limonin, a complex rearranged triterpenoid, by X-ray crystallography (Arnott *et al.* 1960). The same structure was derived chemically and independently by a massive collaborative effort in the laboratories of Arigoni, Barton, Corey and Jeger (Arigoni *et al.* 1960). Barton concluded that the days of chemical structure analysis were numbered, and this realization probably helped to turn his thoughts towards photochemistry. Paul was an influential catalyst in the shift that occurred.

'Photochemical transformations, parts I, II and V' (10–12) launched both Barton and Paul into what was to become a major area of interest for both. These particular papers are devoted to establishing the structures and origins of photosantonic acid (**3**), isophotosantonic lactone (**4**), and lumisantonin (**5**), obtained by irradiation, under different conditions, of santonin (**2**); the structural variety reflects the complexity of the mechanisms at play in these reactions.
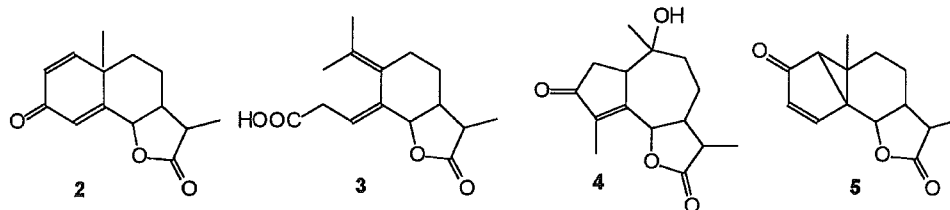
One further paper (8) from the Glasgow period deserves special mention. It was Paul's first significant independent paper and, in spite of its low-profile appearance in *Chemistry and Industry*, was a seminal contribution. He and the mass spectrometrist Rowland Reed showed that the molecular mass of large molecules such as steroids could be obtained with very little material but also that the masses of fragment ions could provide structural information about the parent molecule.

The research programme that Paul inaugurated on arrival in Canada had, as its twin pillars, the structure elucidation of natural products and photochemistry. The structural problems reflected his early experience and interest in terpenoids, a topic in which his authorship of, among other contributions, a readable two-volume monograph (13) made him a considerable authority. He was therefore singularly fortunate on his arrival at Western to find a ready-made problem under way on his doorstep. Dr E.Y. Spencer and his group at the nearby Pesticide Research Laboratory of the Canada Department of Agriculture had isolated helminthosporal, a toxin from a fungus responsible for widespread cereal crop damage in Western Canada. A fruitful collaboration produced the structures of helminthosporal (**6**) and sativene (**7**), along with suggestions for a reasonable biosynthetic pathway (20, 25).
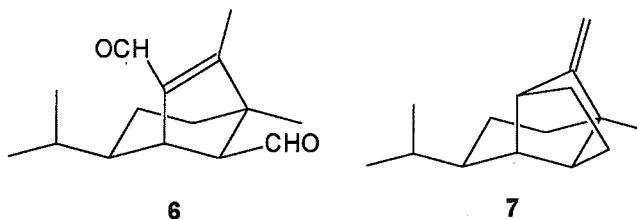
Also investigated shortly after his arrival in Canada were the acidic components of *Ceanothus americanus* (Jersey tea), namely ceanothic acid (**8**) and ceanothenic acid, related to lupeol with ring A contracted (14, 15). Another triterpenoid study led to the formulation of pre-senegenin, polygalic acid and senegenin, which showed that the two latter compounds were artefacts of the isolation procedure (26).

Three papers established the constitution and stereochemistry of the diterpenoid bitter principle chaparrin (**9**) (16, 27, 28).

A series of international collaborations in the elucidation—or revision—of sesquiterpenoid structures was highly fruitful, leading to the formulation of (i) copaene (**10**), with
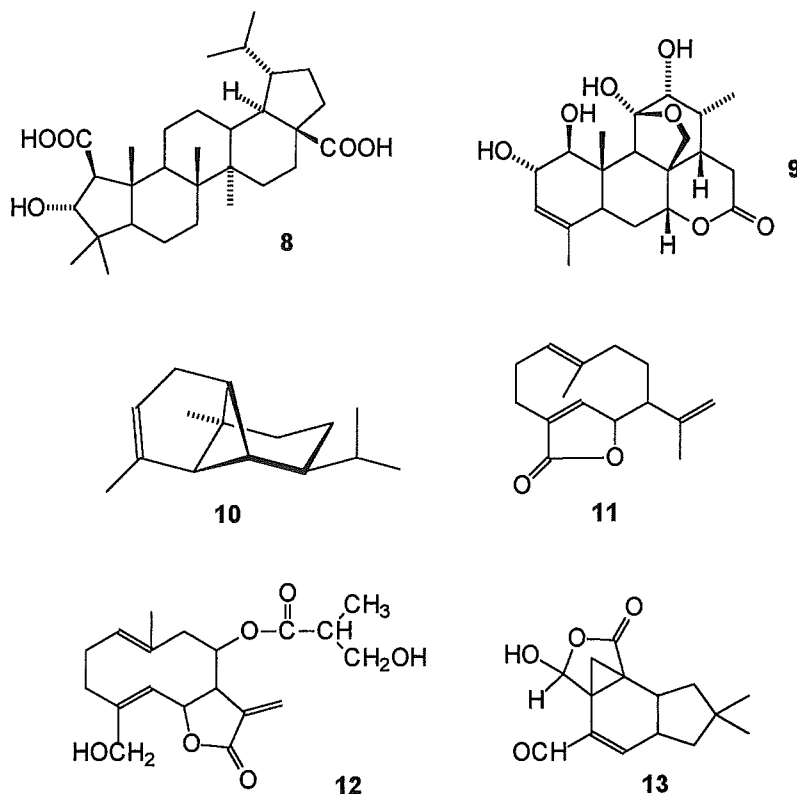
G. Büchi and S.H. Feairheller of Massachusetts Institute of Technology (24), (ii) aristolactone (**11**), with M. Martin-Smith and co-workers in Glasgow (21), (iii) arctiopicrin (**12**), with F. Šorm and co-workers in Prague (23), and (iv) marasmic acid (**13**) with M. Anchel of the New York Botanical Gardens (29).

Paul's final venture into terpenoid chemistry was to show that α-vetivone has a perhydronaphthalene structure (31, 34) rather than the perhydroazulene structure earlier proposed by analogy with its congener β-vetivone. In his words 'terpenoids... are not necessarily known by the company they keep' (31).

Fungal metabolites also attracted Paul's attention early and two very complex antibiotics, in particular, required extended efforts. The work on griseoviridin, from a strain of *Streptomyces viridis*, begun in Scotland and completed in Canada, led to the favoured structure **14** with the possible alternative **15**, later shown to be correct by X-ray analysis (Birnbaum & Hall 1976).

The second complex mould metabolite was primycin, an antibiotic macrocyclic lactone isolated in Hungary by I. Szilàgyi and co-workers. The complex structure (**16**) was finally arrived at by mass spectrometry, in collaboration with D.B. MacLean at McMaster University, and NMR (37).

One problem whose source was neither natural products nor photochemistry was the structure of isamic acid, a product of the reaction of isatin with ammonia, first reported in 1842. The problem proved interesting but difficult; an initially proposed structure was revised to one of two tautomers (**17a**) and (**17b**), which could not be differentiated (30, 32); another
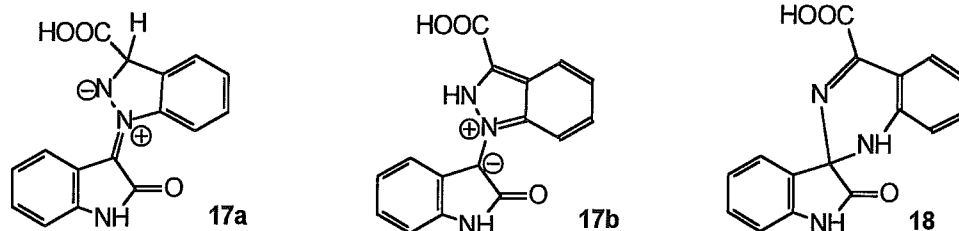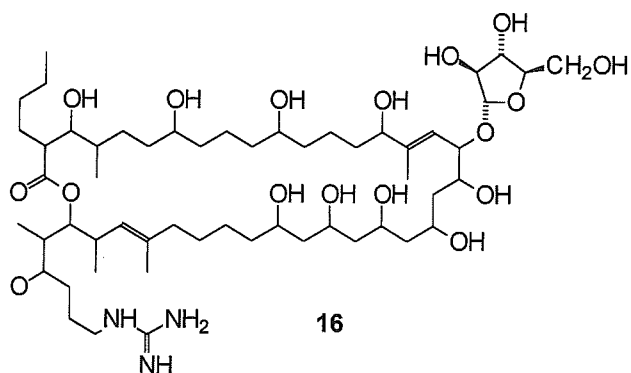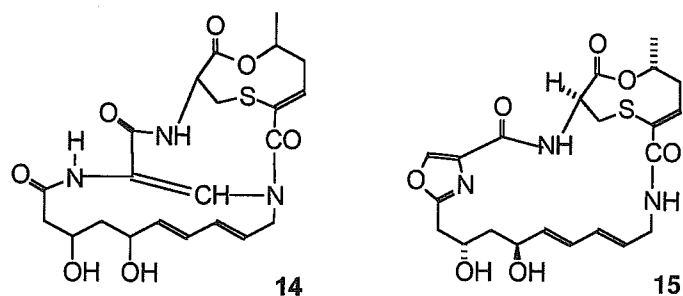
structure (**18**) was put forward by Field (1969) and was strongly supported by Cornforth (1976).

Photochemistry, however, provided the mainstay of Paul's research programme during his entire time at Western. The first work was, quite naturally, a continuation of studies initiated in Scotland. After the complexity of santonin photochemistry, Paul chose what he hoped would be a simpler problem, namely the photochemistry of simple aldehydes and ketones with alkenes. In these reactions the product is typically formed by the removal of the most readily abstracted hydrogen by the excited carbonyl group, followed by coupling of the two radicals; formation of 2-cyclohexenyldimethylcarbinol from acetone and cyclohexene (via the $Me_2C^\bullet$–OH and 2-cyclohexenyl radicals) illustrates the process.

In this context it seemed to Paul that there was probably an error in a report by some Italian workers from the late 1930s describing the photochemical conversion of benzil and acenaphthene into a cyclobutanediol; the diol was reported to yield a 'diacetate' by the action of acetic anhydride and sulphuric acid. Reinvestigation showed that the initial photochemical product was not a diol but rather the product expected from the general scheme noted above, namely phenylacenaphthylbenzoylcarbinol. The 'diacetate', however, provided something

quite unexpected (17) by turning out to be a sultone (**19**) that on irradiation in methanol gave, presumably via an intermediate sulphene (**20**), a sulphonic ester (**21**). This result was of especial interest to one of us (J.F.K.), who had already begun a long-term study of sulphenes; mutual interest in these short-lived species led occasionally to collaboration, notably in the flash thermolysis experiments leading to the observation of the parent sulphene at low temperatures (see below).
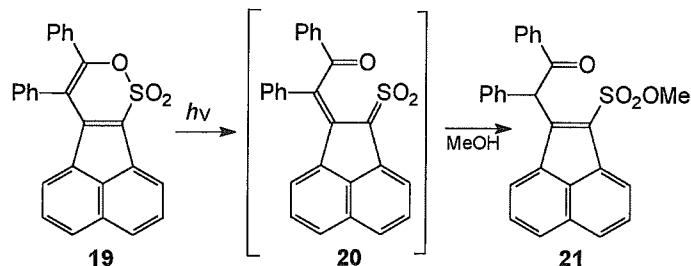
In 1962 Paul and H. Takeshita, a former student of Shô Itô, made an important discovery, the photochemical (or light-induced) cycloaddition of an unsaturated ketone to an alkene. The original example (18) was the photochemical conversion of cyclohexene and acetylacetone into **22** and thence into **23**.
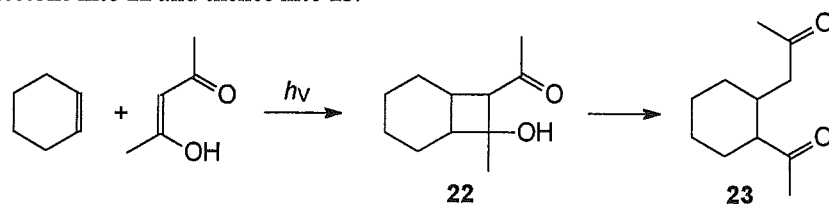
In short order, Paul demonstrated the usefulness in organic synthesis of what was to become known as the 'de Mayo reaction' (the photoinduced addition of enolized diketones to alkenes), with routes to γ-tropolone and some substances in the realm of natural product chemistry: stipitatonic acid, isomarasmic acid and (±)-β-himachalene (**25**), the last by way of the photoadduct **24** (33). Others have also made good use of the method.
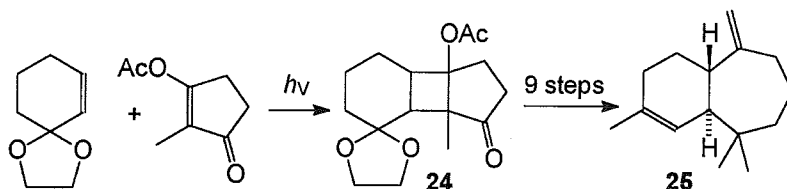

In the meantime a worldwide explosion of interest and growing sophistication in photo-chemistry had occurred, and it was now commonplace to distinguish between singlets, triplets, exciplexes and biradicals. Paul became engrossed in the mechanism of the photochemical cycloaddition of α,β-unsaturated ketones with alkenes, and proposed a modified version of the mechanism originally put forward by E.J. Corey. The reaction in its simplest form was re-garded as that of the triplet ketone with the olefin, but the origin of the observed regio- and stereoselectivity remained uncertain. The problem was only resolved a number of years later by A.C. Weedon, a former postdoctoral co-worker of Paul's, by then working independently at Western, who performed trapping experiments with hydrogen selenide. These brought to

light the importance of the relative rates of ring closure compared with reversion to the starting material of the biradical intermediates.

In the late 1960s Paul took up a topic that he always called 'flash thermolysis', also known as 'flash vacuum pyrolysis'. The apparatus assembled for this purpose in his laboratory was a sophisticated assembly consisting of an oven giving temperatures up to 1100 °C, a vacuum pump capable of yielding pressures of less than 1 μmHg (*ca.* 0.1 Pa) in the reaction zone, and a cryostat for trapping the reaction product at −196 °C (77 K). With this apparatus the experimenter could perform a reaction in the gas phase involving high temperatures with very short reaction times (estimated to be a few milliseconds). The capability of measuring IR and UV spectra of the matrix on the cryostat was added later.

Pentalene was a compound of great interest with regard to theories of aromaticity and anti-aromaticity, but neither the parent nor any derivative simple enough to give a clear notion of the properties of the pentalene system had then been observed. Paul's synthesis of 1-methylpentalene (**27**) from the fulvene derivative **26**, along with its reversible dimerization to **28**, is shown below (36). Its ready dimerization at −150 °C shows that 1-methylpentalene has indeed the properties appropriate to an anti-aromatic species.
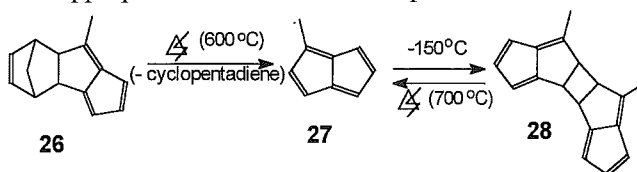
Flash thermolysis was also successful in yielding a sample of sulphene (**30**) in a matrix at 77 K (35). Chlorosulphonylacetic acid (**29**) at 650 °C gave a mixture containing sulphene (**30**), which, on being warmed to room temperature, gave methanesulphonyl chloride; when methanol was introduced after the hot zone into the same product at 77 K and this material was allowed to come to room temperature, the product was methyl methanesulphonate, observations clearly pointing to the presence of **30** in the cold matrix.
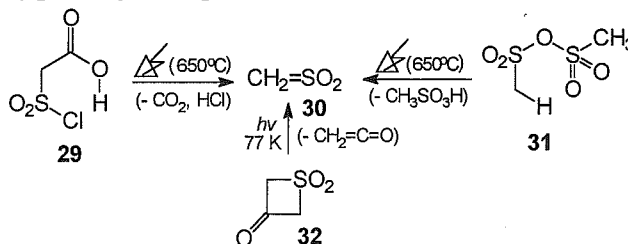

The thermolysis product was collected on the plate of the spectrophotometer and the IR spectrum at 77 K was found to display peaks clearly ascribable to **30**; the same IR signals were found from the thermolysis of methanesulphonic anhydride (**31**) and, in later work, after the low-temperature photolysis of 2-thietanone 1,1-dioxide (**32**), a collaborative study performed with F.C. De Schryver and co-workers (38).

'Aposynthesis' was Paul's term for a reaction of this kind, in which the synthetic goal was achieved by the fragmentation of a larger molecule. Further aposyntheses with flash thermolysis led to cyclopentadienone, thiobenzaldehyde and thioacrolein, among others. Aposynthesis via low-temperature matrix photolysis led not only to sulphene, as above, but also to spectrometric observation of ethanedithial (dithioglyoxal, S=CHCH=S) and its

valence tautomers 1,2-dithiete and thiolthioketene (HSCH=C=S), the last part of this work being in collaboration with O.P. Strausz in Edmonton (45).

The ethanedithial investigation was a component of a larger study of the photochemistry of thiones, itself a logical extension of the ketone photochemistry that had already occupied so much of Paul's time. He later commented on this work, with excessive self-disparagement, that 'since we did not have a systematic approach we accumulated a number of new reactions, some contributions toward mechanism—and an error in interpretation' (52).

Thiones are coloured because of a long-wavelength n,π^* absorption; in addition they show an intense low-wavelength band; they were found to display the unusual feature of giving different reactivity from different excited states. Irradiation of adamantanethione (33), for example, at short wavelengths in cyclohexane gives 34, 35 and 36; the last two are thought to arise from insertion of the excited thione into the C–H bond of the solvent; long-wavelength irradiation of 33, in contrast, gives only 34 (40).
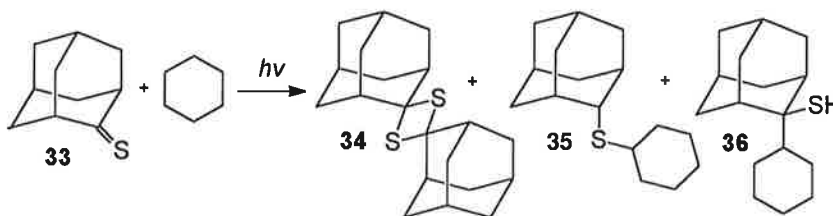
Thione photochemistry provided Paul's last synthesis of a natural product, an elegant route to the sesquiterpene (±)-cuparene (39). The photochemical step 37 → 38 was a nearly quantitative intramolecular bond insertion corresponding to the intermolecular reaction 33 to 36; the overall yield in the six-step process 37 to 39 was 28% (39).
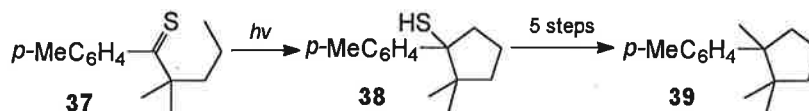
The 'error in interpretation' mentioned above refers to the identification of the excited species responsible for the interesting short-wavelength photochemistry of thiones. A good case was made (40, 42) that this intermediate was the second π,π^* singlet state, S_2. Such a species has been predicted to have a lifetime of less than 1 ps, whereas the intermediate in the thione reactions evidently has a lifetime of around 200 ps. Paul's last comment on the point, some years after he had stopped work on thiones, was, 'The mystery of the 200 ps species is as yet unclear' and 'may represent, when clarified, the most interesting aspect of thione photochemistry yet observed' (52).

All of Paul's photochemical work up to this point had been performed in homogeneous systems. Starting in the late 1970s he became increasingly interested in what could be done by introducing a second phase, first with micelles, then with (non-reactive) solids such as silica gel and alumina, and finally with semiconducting solids such as cadmium sulphide and titanium dioxide.

The earliest of these studies included such varied topics as: (i) photochemically induced reductions of aldehydes and ketones with tributyltin hydride in the presence of a cyclohexane slurry of silica gel; (ii) use of the Barton reaction (photolysis of nitrite esters) to determine

the microscopic viscosity of a micelle core; and (iii) enhancement of the efficiency and selectivity of the photochemical enone dimerization by performing the reaction in potassium dodecanoate micelles.

By looking at phenomena taking place at a silica gel surface bearing adsorbed aromatic hydrocarbons, it was possible to demonstrate the motion of the adsorbed species along a single granule, and also to show the 'surprisingly rapid' intergranular motion on shaking. A review describing some of this work is entitled 'Superficial photochemistry' (44). Other photochemical processes on silica gel examined were: (i) the amide photo-Fries rearrangement, which was shown to yield rather more *para* product than in solution while remaining intramolecular; (ii) photolysis of α-methoxyacetophenones, which gave significant changes from the products in solution; and (iii) addition of steroidal enones to allenes, which led to preferred addition onto the steroidal β-face, presumably because adsorption occupied the α-face.

The use of a semiconducting solid such as CdS, ZnO or TiO₂ adds an important feature to the photochemistry of adsorbed species. Semiconductors are characterized by having valence-band electrons at a somewhat lower level than those in the conducting band. With the above semiconductors the valence bands are at, respectively, 1.6, 2.4 and 2.2 V from the standard calomel electrode, and the corresponding conduction bands are at −0.80, 0.80 and −1.20 V. On excitation of the valence band to the conducting band (by illumination of the semiconductor with light of greater energy than the band gap), the positive centre remaining in the semiconductor (the 'hole') is a powerful oxidant. An organic substrate with an oxidation potential lower than that of the 'hole' can donate an electron to the semiconductor, yielding an organic radical cation.

This pathway is believed to yield a number of notable transformations, such as a [1.3]sigmatropic hydrogen shift converting **40** to **41** (47). *Cis–trans* isomerizations of styrene derivatives and stilbenes (with CdS or ZnS), and 1,2-diarylcyclopropanes (with ZnO) have been induced in this way, as have valence isomerizations of quadricyclane (**42**) to norbornadiene (**43**) (48), and hexamethyl-Dewar benzene (**44**) to hexamethylbenzene (46).
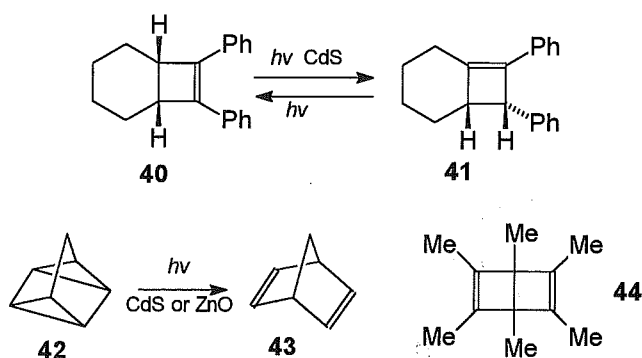
A feature of these reactions is the beneficial effect of molecular oxygen—a species that is commonly the bane of photochemical synthesis. The O₂ apparently traps the electron excited to the conduction band, forming the superoxide anion; this prevents the (wasteful) recombination of the photogenerated hole and electron. Carbon tetrabromide was found (50) also to act as an electron trap, with the advantage of avoiding by-products formed in the presence of O₂.

One important application of semiconductor-mediated photolysis is the photochemical oxidation of pollutants from contaminated water and air. Paul left the specific applications in this field to others but was well aware of the relevance of his own work to this important problem; his final remark in his memoir (52) is the parenthetical question, 'Shall photochemistry redeem the sins of the chemist?'.

As Paul's health declined, his research group gradually diminished in number, and his laboratory closed in 1991. He had long been interested in both the philosophy and the history of chemistry and his last scholarly endeavours were in that area (49, 51). Along with this was an interest in occult topics and in how people of apparent intelligence could seemingly be persuaded of their validity. He once presented a well-attended lecture at Western entitled 'Witchcraft'. The Elizabethan alchemist–mystic John Dee caught his imagination and he spent much of his limited energy in the last years studying him. He submitted a manuscript on Dr Dee, but it was deemed too long and he died before he could revise it.

A PERSONAL SKETCH

Most people found Paul an interesting man to meet. He had a capacity to charm and to challenge, but also, occasionally, to annoy or even infuriate. He clearly wished to be regarded as someone of consequence, although he never sought status via an official position such as Head of the Department. He was acknowledged by his organic colleagues at Western as their unofficial head, and although he had strong views as to how things should be done, he normally achieved his goals by individual persuasion; he preferred the 'oblique approach' (his term) to frontal attack.

Outside chemistry his interests included literature and philosophy, drama, art and music, but especially food and wine, and cabinet making. He was uninterested in most outdoor activities, partly, perhaps, because of poor eyesight. Paul became a skilled cook in the classical French tradition, going to much trouble (on his part and with a lot of effort on Mary's part too) to get the best ingredients and to practise until he had got it right. He was a connoisseur of wine and as his purchasing power increased he built up a substantial wine cellar with a distinct bias in favour of distinguished clarets. Dinner at the de Mayos' could be a rare culinary experience. The handsome dining table was Paul's design and handiwork. Not long after coming to Canada Mary had decided that two problems, the dearth of good furniture in Canada and Paul's perceived need for exercise, could both be solved if Paul were to take up cabinet work. With his usual application he assembled a well-equipped workshop and produced a number of carefully crafted pieces in both modern and classical styles. He devised a style of his own that he was pleased to label 'Louis XX', essentially what he imagined French cabinet makers might have produced if Napoleon had never existed.

As a teacher of chemistry Paul was impressive, and unusual. Professor Hamish Sutherland writes:

> I was starting the second year of my Ph.D. when the Barton group arrived in Glasgow. It was a 'culture shock' for the incumbents but not an unpleasant one, because we were aware of the distinction of the group. Before DHRB's arrival we did not have any colloquia. When I was detailed to be the first of the GU people to give a talk, I was terrified and surprised when the 'hard man' (P.deM.) came to me before the lecture and said 'Do you have any questions you want me to ask?'

Paul's problem seminars, begun in Glasgow, became an important regular feature of his teaching at Imperial College and at Western, where they gradually evolved with time. George Morrison, a graduate student at Glasgow in Paul's time, writes, 'it was a revelation to me that so much of chemistry could be rationalised and *predicted* by intelligent arrow pushing'. Paul's overpowering respect for logical argument and his sheer enjoyment of sharing this with young students over a seemingly obscure problem made these sessions memorable for the participants and an example that they would themselves follow in later years. At Western they were initially given by Paul alone, but later shared with the other organic faculty members. His teaching duties there consisted of a fourth year half course for Honors Chemistry students and a biennial offering on the evolution of chemical thought (with Mel Usselman), plus graduate teaching, including a regular half-course in photochemistry, and problem seminars. In all of his teaching he challenged individual students to think critically and to understand fully. He very much enjoyed the give and take of a good argument and many of his more self-confident students happily took up the challenge. The ratings given by the students both for his teaching and the content of his courses were uniformly high.

To the actual writing of his more than 250 scientific papers, Paul's contribution was substantial. His more literate students were encouraged to write a first draft and to make further comments; the last word was his. His writing style was clear and generally straightforward, though he often put in a few special turns of phrase, bits of 'mayonnaise' as he called them. It is perhaps easiest to find the unrestrained de Mayo style outside the conventional chemical papers, in such places as the forewords to his monographs on molecular rearrangements (19, 22, 43) or his personal memoir (52). He was a firm believer in the notion that the serious need not always be solemn. Oblique, obscure, or even totally baffling references were part of Paul's idea of entertainment. An example is to be found in his full paper on the 'aposynthesis' of thiobenzaldehyde and thioacrolein (41), which includes the following: 'The calculated (25) spectrum of **7** [thioacrolein] includes maxima at 265 and 570 nm[5] ...'; footnote 5 reads (in full), 'The CNEBI approach yields similar results.' CNEBI was not explained nor could it have been expected to be common knowledge; it stood for Complete Neglect of Everything But Intuition.

No account of Paul would be complete without mentioning Ferdinand, his stick-man *alter ego* (figure 1), whose most notable feature was an ability to express much in body language. Informal notes to colleagues were often 'signed' by a figure of Ferdinand in an appropriate pose. Lecture notes given out to undergraduates show a puzzled Ferdinand standing
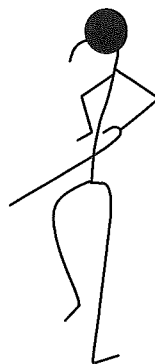

Figure 1. 'Ferdinand'.

beside 'HΨ = EΨ THIS IS AS NEAR THE TRUTH AS YOU WILL GET'. Nearby, beside a simple Hückel molecular orbital diagram of cyclobutadiene with non-bonding orbitals marked 'degenerate', a sprightly Ferdinand comments 'Sounds fun'. Ferdinand shared Paul's infirmities and the picture shown here derives from Paul's later years when walking required the help of a cane.

Paul's physical afflictions were slow to stop him; he wrote more than fifty papers essentially from the wheelchair. His determination was legendary, as also were his high standards and uncompromising integrity. He was probably more generous with praise of someone behind his back than to his face, but students and colleagues learned—however obliquely—of their place in Paul's esteem, and he inspired much affection, great respect, and complete trust.

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