

# IUPAC Polymer Division at 50 Years

by Richard "Dick" Jones

For most of us, history is marked by significant anniversaries following from recognisable start or end dates: birthdays, wedding anniversaries, monarchical reigns, wars. So it is that this year we are celebrating the 50<sup>th</sup> anniversary of the formal inception of the Polymer Division under its former name as the IUPAC Macromolecular Division. However, the Division has a significant pre-history that essentially maps the development of polymer chemistry to a mature discipline in its own right. By the 1920s, through the efforts of individuals who recognized the need, a common language of communication was already in the offing. These people formed committees to consider the development of systematic nomenclature, terminology and definitions, symbols, and other matters of importance in polymer science. All of this work became the foundations on which IUPAC built its growing interest in macromolecules, of which I would know very little if it were not for the excellent *History of IUPAC 1919-1987* [1] and *History of IUPAC 1988-1999* [2] upon which I have been able to draw.

By the late 1940s, before IUPAC had established the divisional structures with which we are familiar today, there was already a Commission on Macromolecules (later Macromolecular Chemistry) within what was then the Physical Chemistry Section and a Division on Plastics and High Polymers in an Applied Chemistry Section. In 1952, IUPAC published its first paper in the area of macromolecular nomenclature under the aegis of the Sub-commission on Nomenclature of the Commission on Macromolecules, this being a subgroup of those concerned with nomenclature, terminology and symbols in inorganic, organic and physical chemistry. This paper, by such notables as J. J. Hermans, M. L. Huggins, O. Kratky, and H. F. Mark [3], was a landmark in that, for the first time, it systematized the naming of macromolecules and various symbols and terms commonly used in polymer science. It introduced the use of parentheses in source-based polymer names when the monomer from which the polymer is derived consists of more than one word, a practice that is now widely followed. It recommended an entirely new way of naming polymers based on their structure that included the suffix "amer", a recommendation that in contrast has been almost totally ignored. After ten years, the Sub-commission published its second report [4], which dealt with the rapidly developing field of stereoregular polymers consequent upon the synthetic procedures discovered by Ziegler and Natta, while



*Driving ahead in the 21st century and lead by Jung-Il Jin, the Polymer Division met at the IUPAC General Assembly in Torino, Italy in 2007. Direct Past Division President at the time was Bob Stepto (3rd from the right).*

a revision [5,6] of the definitions in the original report appeared in 1966. Meanwhile, the IUPAC International Symposia on Macromolecules had been conceived, the first taking place in 1957, and by 1966 there had been five: two in Prague and one each in Wiesbaden, Paris, and Tokyo-Kyoto. So, in view of the burgeoning industrial importance of polymers and the evidently increasing profile of IUPAC in polymer chemistry, the eminent Czech scientist famed for his development of poly(hydroxyethyl methacrylate) and the invention of the soft contact lens, Otto Wichterle, [7,8] a Bureau Member and Chair of the Commission on Macromolecules, was asked to coordinate IUPAC interests in macromolecular science. His report led to the creation of a new Macromolecular Division (Division IV) in 1967, the 50<sup>th</sup> anniversary of which we mark in the following pages.

At birth, the Macromolecular Division Committee consisted of eight Titular Members and five Associate Members under the presidency of Otto Wichterle, and for a few years its work continued to be in the organization of division meetings and international symposia, and otherwise that of the former Commission on Macromolecules and of the Plastics and High Polymers Section. It seems to have been an early determination of the founding fathers that these activities should develop without forming permanent commissions. The only one that was formed and approved in those early days was to deal solely with nomenclature issues: the Commission on Macromolecular Nomenclature (IV.1). All other work



*Otto Wichterle [8]*

was to be done by working groups, *ad hoc* committees and carefully selected experts.

By the mid-1970s, it was clear that this essentially unique organization of the Division's business was an impairment to progress and that the establishment of another commission to embrace the work of working parties would be a sensible development. In 1975, following agreement within Council, the Commission on Polymer Characterization and Properties (IV.2) came into being at the 28<sup>th</sup> IUPAC Conference, the last to be so-called as thereafter they have been termed General Assemblies.

During the 26<sup>th</sup> Conference in 1971, the Officers of Division IV had met with their opposite numbers in Division VI, the Applied Chemistry Division and, in particular, representatives of the Section on Organic Coatings (VI.6). The goal of the meeting was to negotiate the possible relocation of the Section to the Macromolecular Division, this being seen as a sensible requirement of a reorganization of Division VI. This was agreed to at the 27<sup>th</sup> Conference and the Section was duly incorporated as a Working Party on Supported Polymer Films within Commission IV.2.

At this point, perhaps a short digression can be permitted. The Macromolecular Division was noteworthy not only in its rejection of the word *Chemistry* from its name and its evident dislike of commission

structures, at least in its early days, but also in the composition of the Division Committee. This was unusual, in that such committees did not have Associate Members. With a total of thirteen members, it was already one over the number that had been approved by the Executive Committee at inception. Undeterred, by the end of the 25<sup>th</sup> Conference the number of Division Committee members had already risen to 11 Titular Members, 7 Associate Members, and, as another departure from custom, 18 National Representatives. With the inclusion of representatives of other International Unions—those of Pure and Applied Physics and of Biophysics—the Division was becoming a law unto itself. All this to manage the affairs of one division and what would eventually be two commissions? It was little surprise that the Bureau required the Division to reduce its membership to just 10 by 1975, but even then nothing was done about the attendance of National Representatives at meetings.

In 1971, Otto Wichterle was succeeded as Division President by Henri Benoit (France) and thereafter at four-yearly intervals up to 2001 by such eminent scientists as Charles Overberger (USA), Viktor Kabanov (USSR), Clement Bamford (UK), Takeo Saegusa (Japan), Walter Heitz (FGR), James Economy (USA) and Robert Gilbert (Australia). Within this period, another

*At right, The Polymer Division poses in Seoul, 1996.  
front row: Máximo Barón, Jung-Il Jin, James Economy  
(Division President), Jim Guillet, Robert (Bob) Gilbert.*

*Below, attendees at the Beijing 2002 Conference:  
back row: Werner Mormann, Alain Fradet, Ted Wilks,  
Jaroslav Kahovec, Jiří Vohlídal, Pavel Kratochvíl, Dick  
Jones, Bob Stepto (Division President), Bill Work,  
Przemysław Kubisa, Jiasong He; front row: David  
Tabak, Jung-Il Jin, Kazuyuki Horie, Michael Hess,  
Máximo Barón, Tatsuki Kitayama, Taihyun Chang*



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commission was established within the Division, that of Functional Polymers (IV.3), otherwise the direction and purpose was maintained without interruption.

In the 1980s, what had started out as intended annual International Symposia on Macromolecules switched to being biennial meetings which were renamed as World Polymer Congresses, the first being under the concise label MACRO 1998, a brand name which pertains to this day. (see more page 28) These are held in so-called off years, the years between General Assemblies. By the 1990s, the Congresses had assumed much of the complexity that surrounds bids for the Olympic Games. Invitations for National Adhering Organisations to host the events are issued some ten years in advance with contenders being expected to present their plans to a meeting of the Division Committee during a General Assembly and to elaborate on their development at subsequent meetings until a victor emerges, after which they must report progress year-on-year until the event takes place.

In 2002, following a lengthy consultation process, the details of which are too complex to enter into here, IUPAC underwent a significant reorganization of its structures and methods. As far as Division IV was concerned, the most significant changes were the abolition of commissions and their replacement with subcommittees dedicated to tasks within a specific area, and otherwise what was to follow from the establishment of a new Division of Chemical Nomenclature and Structural Representation (Division VIII). It seemed that, at a stroke, all of the Commission IV.1 work would transfer to the new division. As a rationalization this was illogical, as all the background knowledge and expertise that was idiosyncratic to polymers resided within the membership of Division IV. Fortunately, it was soon evident that the new division had no more enthusiasm for acquiring polymer-related expertise that would not sit comfortably within its fields of study than Division IV had for relinquishing it. Accordingly, Commission IV.1 morphed into a Subcommittee on Macromolecular Terminology and the two Division Presidents agreed that, whilst overall responsibility for macromolecular nomenclature must reside in Division VIII, its development would be delegated to the new subcommittee. This is an arrangement that has worked very well and for which we owe debts of gratitude to the then President, Robert Stepto, and his opposite number in Division VIII, Alan McNaught, for satisfactorily resolving what would otherwise have been an almost intractable problem.

The valuable work of Division IV has thus been maintained into the 21<sup>st</sup> Century under the leadership

of Presidents Robert Stepto (UK), Jung-Il Jin (South Korea)—who left the Division when he was elected IUPAC President, Christopher Ober (USA), Michael Buback (Germany), and now Gregory Russell (New Zealand). A review of the Division's mission statement recognised that macromolecules as individual molecular entities comprise materials called polymers. Both of these are our concern, which has led to the renaming of the Division as the Polymer Division. A similar rationale has been applied to the names of the divisional subcommittees of which there are now four: Polymer Terminology, Polymer Education, Modelling of Polymerization Kinetics and Processes, and Structure and Properties of Commercial Polymers.

Amongst the ensuing articles are contributions that describe conference activities and the evolution and inner workings of selected subcommittees and which identify some of the dedicated people who 'keep and have kept the show on the road' to the present day. 🌐

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