Harland was always involved in scientific activities outside the university. He served on many study section and advisory boards. He was president of the American Society of Biological Chemistry (1959–1960) and president of the International Union of Biochemistry (1979–1985) and during the presidencies of Lyndon Johnson and Richard Nixon was a member of the President's Science Advisory Committee. Harland was on many editorial boards and was one of the founding editors of *TIBS*. As a young member of the *JBC* Editorial Board, he was instrumental in eliminating self-perpetuating appointments by resigning after five years, arguing, and finally brashly stating 'Listen, if all you guys died tomorrow, a good Board could be picked the next day to replace you.'

Harland's scientific contributions were recognized throughout his career. He was a member of the National Academy of Sciences and of the American Academy of Arts and Sciences. He received numerous honorary degrees and awards including the National Medal of Science – pretty good for a kid who spent two years in kindergarten and two years in the first grade.

Everyone who knew Harland revered him, not just because of his accomplishments, but because of his basic intellectual honesty. Here was a man with no pretensions, a man whose opinions and decisions were always based on principles and not on any personal factors, a man who by his example got the best out of his associates, and a man whose warmth and openness made him a true friend to countless people. His enormous energies, whether focused on a problem, writing a grant, or even at age 77, 30 feet up a tree while hunting deer, were the envy of all his many friends. Harland's total dedication to science has been and will be an inspiration for all of us who have had the privilege and the pleasure of knowing him. He was unique and irreplaceable.

DAVID A. GOLDTHWAIT

Department of Biochemistry, School of Medicine, Case Western Reserve University, Cleveland, OH 44106, USA.

FEATURES

Federation of Asian and Oceanian Biochemists: where now after 20 years?

Jisnuson Svasti

Science is international and transcends national frontiers. The International Union of Biochemistry and Molecular Biology (IUBMB) and the three regional associations, the Federation of European Biochemical Societies (FEBS), the Pan American Association of Biochemical Societies (PAABS) and the Federation of Asian and Oceanian Biochemists (FAOB), play an important role in helping to stimulate international cooperation between biochemists of different nations.

The Federation of Asian and Oceanian Biochemists was jointly founded on 1 August 1972 by the Australian Biochemical Society, the Society of Biological Chemists (India) and the Japanese Biochemical Society, to promote the development of biochemistry in the Asian and Pacific region. Although the FAOB is the youngest of the three regional associations in biochemistry, it is probably one of the first scientific associations focused solely on the Asian–Pacific region, which has become such an important force in the world economy today.

The FAOB has grown rapidly and now has 17 Constituent Members representing some 17 500 biochemists (Table I). Membership of the FAOB spans very large geographic distances, and covers not only a range of ethnic groups but also a wide spectrum in academic capability and manpower resources. For example, the largest society has nearly 10 000 biochemists and has been in existence for more than 60 years, while the smallest group has only 10 members and has been in existence for only one year. Undoubtedly, the FAOB has played an important catalytic role in stimulating the association of biochemists in many countries in the region.

The Federation adopted a new logo (Fig. 1) in 1989, which reflects the dynamic nature of the FAOB and the continual flow of information in biochemistry between members. Each Constituent Member is represented by one delegate on the Federation's Council, which meets once a year, with an elected Executive Committee acting for the Federation between meetings of Council. The Executive Committee comprises President, Secretary-General, Treasurer and President-Elect or Immediate Past President. Others responsible for specific jobs include the Editor of the FAOB News and the Chairman of the Fellowships Committee, and when necessary *ad hoc* committees, such as the Publications Committee, are appointed for particular tasks.

The initial activities of the FAOB during the first four years were limited to partial sponsorship of a few international symposia held in member countries. However, with the increase in Constituent Members and after some administrative restructuring to overcome operational difficulties, in 1977 the FAOB began sponsoring its own

Jisnuson Svasti, President of the FAOB for 1990–1992, is at the Department of Biochemistry, Faculty of Science, Mahidol University, Rama VI Road, Bangkok 10400, Thailand and at the Chulabhorn Research Institute, 54 Moo 4 Talad Bangkhen, Don Muang, Bangkok 10210, Thailand.

Table I. Constituent Members of the FAOB

	Number of members	Year of foundation
Australian Society for Biochemistry and Molecular Biology, Inc.	1050	1954
Bangladesh Biochemical Society	350	1977
Chinese Biochemical Society	1200	1979
Hawaiian Biochemists Group	50	1975
Hong Kong Biochemical Association	50	1976
Society of Biological Chemists (India)	2350	1930
Indonesian Biochemical Society	250	1976
Japanese Biochemical Society	9240	1925
Biochemical Society of the Republic of Korea	1420	1967
Malaysian Biochemical Society	120	1973
Myanma Biochemists Group	10	1990
New Zealand Biochemical Society	218	1971
Philippine Biochemical Society	200	1973
Pakistan Society of Biochemists	80	1963
Singapore Biochemical Society	120	1982
Biochemical Society located in Taipei, China	425	1970
Biochemical Section of the Science Society of Thailand	220	1973

meetings, co-hosted by a local society or group. FAOB Congresses, held triennially, and FAOB Symposia, held in intervening years, now constitute the major scientific activity of the Federation. The FAOB Congresses have steadily improved to a very high scientific quality, and now form major events in the biochemical calendar of the region; the last Congress in Seoul had 1500 participants. Symposia tend to be somewhat more variable in character, depending on the strength and location of the host organization, with up to 200 participants.

With its limited financial resources, support by the FAOB for Symposia and Congresses tends to be of a catalytic nature, with organizers expected to raise additional funds. Moreover, there is a need to balance the selection of major speakers to include the local scientists from the region as well as the internationally famous names because, after all, the FAOB is a regional organization, and its meetings should show the best work that is being done in the region. Occasionally, token support (<US$2000) is still given to other Symposia or Workshops in the region. However, as more requests for support are received, new guidelines have been drawn up to ensure that the FAOB and the local Constituent Member really do receive some benefit from such sponsorship.

Other activities involve young scientists. Some 60 Travel Fellowships have now been awarded for attendance of FAOB Congresses and Symposia, and these provide opportunities for young scientists in less developed countries to experience the atmosphere of an international meeting. Research Fellowships are designed to assist the young scientist to spend a few weeks in another laboratory in the region to learn specific techniques that would be useful for their research at home: however, few have so far been awarded due to lack of funds. If successful, current fund-raising efforts should allow expansion of the Research Fellowships scheme, and initiation of other programs, such as regional workshops.

The FAOB has accomplished much over the last 20 years, despite the difficulties posed by the geographical distribution and diversity of member societies. However, the evolution of the FAOB has raised problems in terms of organizational structure, administration, finance and communication. In the last three or four years, serious efforts have been made to tackle these problems, including a revision of the Statutes (for the first time in 10 years). Formal registration of the FAOB as a non-profit organization in one of the member countries is also being actively explored. Greater efforts must also be made to increase the membership of the FAOB to cover more countries in the Asian–Pacific region.

Limited finance is a perennial problem. The FAOB now derives its income from two major sources: (1) a triennial grant from IUBMB, which is essential in providing partial support for the various FAOB meetings; parenthetically, the link with the IUBMB has been very important in the FAOB's development, and it is good to see that the 1st IUBMB Conference will be held in Japan in 1992, and the 16th IUBMB Congress in India in 1994. (2) Constituent Members pay annual subscription fees, with each society electing to pay US$0.25, 0.50 or 1.00 for each of its members, depending on its financial status. The subscription rate has no bearing on voting rights, since each society has one vote in Council. Interest from Endowments are used to sponsor plenary lectureships (the Japanese Biochemical Society Lecture and the Murachi Memorial Lecture). Occasional donations are another source of income. More recently, a scheme has been introduced that permits interested organizations and companies to become Special Members of the FAOB. The total income of the FAOB is only about US$75 000 per triennium. Over the next few years, greater efforts must be made in fund-raising through Special Memberships and Endowments. It is also hoped that profit-sharing with host societies will generate income from FAOB Congresses and Symposia.

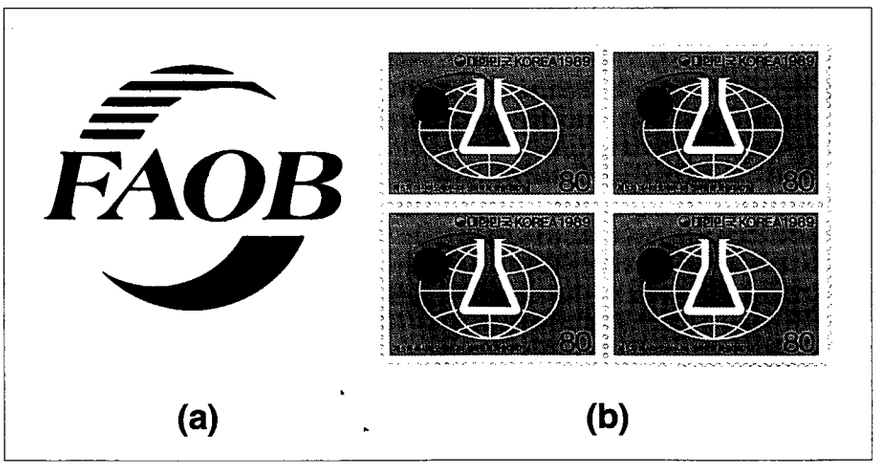

Figure 1
(a) New logo of the FAOB adopted in 1989. (b) Republic of Korea postage stamp issued in commemoration of the 5th FAOB Congress 1989.

Communication is another area of difficulty. Problems include the wide geographical spread of member countries, and, in some countries, poor communication facilities or the lack of funds for sending a representative to Council Meetings. Council Delegates are the lifelines that link the central organization of the FAOB to Constituent Members and unless that lifeline is effective, then that society and its members will become isolated from the FAOB. In an effort to improve communications, the FAOB issues a biennial newsletter for each member society to photocopy and distribute to its members. The President also sends a monthly letter to Council delegates.

Other forms of publication have been recently discussed. The launch of an FAOB research journal was originally debated over ten years ago but discussion has now broadened to include other kinds of publication, such as a review-type publication or a members' magazine. The primary objectives of the FAOB in launching a new publication are still a topic of debate: should it increase international prestige, generate income, or create a vehicle for enhancing communication and promoting a sense of identity in members? It is hoped that some consensus on this issue will soon be reached. The decision is an important one. The launch of any publication will reflect how Constituent Members view the future role of the FAOB in the region over the next few years.

Having witnessed much of the progress that has been achieved over the years, I still feel that the essential spirit of the FAOB has remained the same, namely that it is a Federation that exists *for* and exists *through* the cooperation of Constituent Members. If all those involved in the FAOB can retain this spirit of cooperation, then I am sure that the FAOB can find solutions to its immediate problems and have an even greater impact on the development of biochemistry in the Asian–Pacific region in the third decade of its existence.

TALKING POINT

DNA polymerase ε: in search of a function

Ulrich Hübscher and Pia Thömmes

The current model of eukaryotic DNA replication involves the two DNA polymerases δ and α as the leading and lagging strand enzymes, respectively. A DNA polymerase first discovered in yeast has now been found in all eukaryotic cells and is termed DNA polymerase ε. In yeast, the gene for DNA polymerase ε has recently been found to be essential for viability, raising new questions about its functions.

ALL PROKARYOTIC and eukaryotic cells contain several DNA polymerases. Besides replication of the chromosomal DNA, the cell requires DNA polymerases for other DNA synthesis events such as DNA repair, nuclear DNA recombination and replication of extrachromosomal (i.e. plasmid or mitochondrial) DNA. In bacteria, these tasks are shared by the three different DNA polymerases I, II and III. In some instances plasmids and bacteriophages (e.g. T4 or T7) encode their own DNA polymerases[1].

At least five different DNA polymerases have been identified and purified from eukaryotic cells[2]. The subunit composition of the yeast enzymes is nearly identical to the one in higher eukaryotes which has lead to a new nomenclature for eukaryotic DNA polymerases[3]. According to this new classification, all eukaryotic polymerases are denoted by greek letters (Table I). *DNA polymerase* α (reviewed in Ref. 4) is important in nuclear DNA replication. Recent data strongly suggest that it has a role in the initiation of the lagging strand of the replication fork[5]. *DNA polymerase* β (reviewed in Ref. 6) is the major repair enzyme in the nucleus and appears to be involved in DNA recombination[7]. *DNA polymerase* γ (reviewed in Ref. 6) carries out DNA replication of the mitochondrial genome. *DNA polymerase* δ (reviewed in Refs 8 and 9), first described in 1976, was originally distinguished from DNA polymerase α by its 3'→5' proofreading exonuclease activity[10]. Subsequently, all eukaryotic 3'→5' exonuclease-containing DNA polymerases were called DNA polymerase δ. DNA polymerase δ is involved in nuclear DNA replication and is the prime candidate for replication of the leading strand of the replication fork. On model homopolymer template/primers [e.g. poly(dA)/oligo(dT)] containing long single-stranded regions, this enzyme requires an auxiliary protein, called proliferating cell nuclear antigen (PCNA), for processive DNA synthesis[8]. In higher eukaryotic cells, a second 3'→5' exonuclease-containing DNA polymerase was isolated from calf thymus[11] and HeLa cells[12] which was independent of PCNA for processive DNA synthesis. A similar enzyme had been discovered more than 20 years ago in yeast[13]. Originally known as DNA polymerase II (Table II), this enzyme is now called *DNA polymerase ε* (reviewed in Ref. 14). Table II gives a brief history of DNA polymerases α, δ and ε.

What is the function of DNA polymerase ε? An involvement in the

Ulrich Hübscher and **Pia Thömmes** are at the Department of Pharmacology and Biochemistry, University of Zürich–Irchel, Winterthurerstrasse 190, CH-8057 Zürich, Switzerland.