

The International Union for Vacuum Science, Technique and Applications (IUVSTA)

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An Introduction to The International Union for Vacuum Science, Technique and Applications (IUVSTA)

The IUVSTA is an international federation of national vacuum organizations (i.e. vacuum societies or national committees on vacuum), currently 26 in number, which had its origin in June 1958, in Namur, Belgium. Each of the 26 countries is represented by a councillor. Individual or private membership is excluded.

Its purpose is to promote vacuum science and technology on an international level. This includes promotion of vacuum education and research and the establishment of international vacuum standards for nomenclature, measuring technique, and vacuum equipment fittings. It encourages the establishment of national vacuum societies or committees on vacuum in countries where up until now, no such national group exists.

The IUVSTA is a multidisciplinary organization of which its current 26 member countries represent nearly 11,000 physicists, chemists, materials scientists, engineers and technologists worldwide.

The official languages of the IUVSTA are French, English and German. The IUVSTA has its legal registered office in Brussels, Belgium, Avenue de la Renaissance 30, B-1040, Brussels, Belgium, and is an official international association registered in compliance with Belgian law having scientific aims which was approved by Royal Decree of 2 May 1963.

The following pages offer a brief description of IUVSTA and its activities. For additional information write, telephone or telex:

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A brief history

IUVSTA had its origin on 13 June 1958, in Namur, Belgium at a meeting called the 'Premier Congres International pour L'Etude des Techniques du Vide'. At this meeting, the International Organization for Vacuum Science and Technology (IOVST) was structured under the leadership of Professor Emil Thomas of Belgium who was its president. In 1961, the IOVST held its second International Congress in Washington, DC in combination with the 8th National Vacuum Symposium of the AVS. An equipment exhibit was held for the first time during this meeting. The meeting and exhibit proved to be very successful for both organizations from a technical and financial point of view.

The next year on 8 December 1962 in Brussels, Belgium the IOVST was dissolved and a new organization called the

International Union for Vacuum Science, Technique and Applications (IUVSTA) was formed to represent national vacuum societies of various countries instead of individual members in various countries. A new constitution for IUVSTA was drafted and all the assets and records of the IOVST were transferred to the new organization.

Medard W Welch of the USA, who played a leading role in its formation, was chosen as IUVSTA's first president. Vacuum groups from 10 countries became charter members of the Union. These included:

Belgium;
Federal Republic of Germany;
France;
Great Britain;
Netherlands;
Spain;
Sweden;
Switzerland;
United States of America;
Yugoslavia.

IUVSTA structure and organization

The IUVSTA is structured and organized as follows (see Figure 1).

A. Twenty-six national vacuum societies or committees on vacuum send delegates to a General Meeting which assembles every third year. As the highest authority of the union, it is responsible for all basic decisions, especially changes in statutes, questions of membership and the financial budget. It elects a Vice President, who shall be the next President (i.e. President Elect) and, on the proposal of the President, four officers, consisting of a Secretary General, a Treasurer, a Scientific and Technical Director and a Secretary. The General Meeting then elects on proposal by each country's national vacuum society or committee on vacuum, 26 national councillors. The President along with the two Vice Presidents (the second being the President of the past triennium), 4 officers and 26 national representatives then make up the Executive Council. Elections are held every 3 yr at a General Meeting and the business of IUVSTA is conducted at Executive Council meetings, typically held twice a year at different locations usually associated with a technical meeting or vacuum symposium.

Members are the national vacuum societies or committees on vacuum of the following countries:

A = Austria;
AUS = Australia;
B = Belgium;

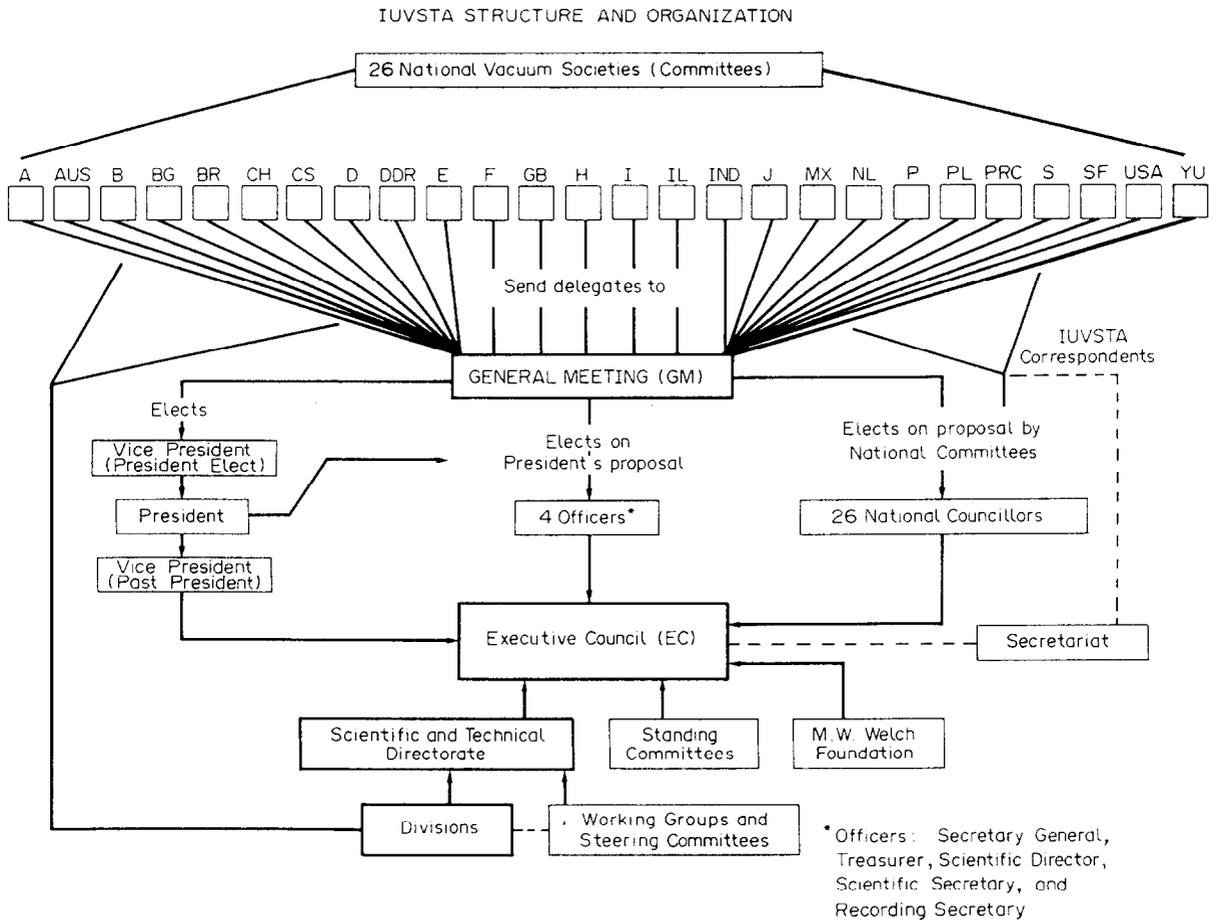


Figure 1. IUVSTA structure and organization.

- BG = Bulgaria;
- BR = Brazil;
- CH = Switzerland;
- CS = Czechoslovakia;
- D = Federal Republic of Germany;
- DDR = German Democratic Republic;
- E = Spain;
- F = France;
- GB = Great Britain;
- H = Hungary;
- I = Italy;
- IL = Israel;
- IND = India;
- J = Japan;
- MX = Mexico;
- NL = Netherlands;
- P = Portugal (provisional membership);
- PL = Poland (provisional membership);
- PRC = Peoples Republic of China;
- S = Sweden;
- SF = Finland;
- USA = United States of America;
- YU = Yugoslavia.

- surface science;
- thin film;
- vacuum science;
- electronic materials and processing;
- fusion;
- vacuum metallurgy.

The one steering committee of IUVSTA focuses on applied surface science.

The structure of the Scientific and Technical Directorate is as shown in Figure 2.

SCIENTIFIC AND TECHNICAL DIRECTORATE

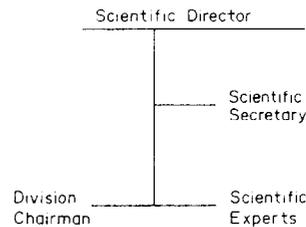


Figure 2. Scientific and Technical Directorate.

B. The Scientific and Technical Directorate (STD) coordinates the work of six divisions, working groups, and currently one steering committee. The six divisions of IUVSTA focus on the following multidisciplinary areas:

C. The President appoints the chairmen of standing committees which perform various IUVSTA activities. These committees, currently nine in number, consist of:

- Congress Organizing Committee;

- Congress Planning Committee;
- Education Committee;
- Finance Committee;
- Latin American Activities Committee;
- Liaison Committee;
- Previous Decisions Committee;
- Publications Committee;
- Statutes Committee.

Committee Chairmen then appoint members to their committees from the Executive Council or national vacuum societies or committees on vacuum. Chairmen and members of standing committees who are not Executive Council members participate at Executive Council sessions as observers with the right to speak but not to vote. The structure of each standing committee is as shown in Figure 3.

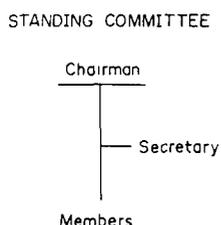


Figure 3. Standing Committee structure.

National vacuum societies (committees).

- A—Österreichische Gesellschaft für Vakuumtechnik (ÖGV).
- AUS—Vacuum Physics Group of the Australian Institute of Physics (VPG).
- B—Société Belge de Vacuologie et de Vacuotechnique/Belgische Vereniging voor Vacuologie en Vacuumtechniek (BELVAC).
- BG—Bulgarska Akademiya na Naukite-Natsionalen Komitet za Vakuumka Fizika e Technika (BNVC).
- BR—Sociedade Brasileira de Vácuo (SBV).
- CH—Schweizerische Gesellschaft für Vakuum-Physik und -Technik (SGV)/Société Suisse pour la Science et la Technique du Vide (SSSTV).
- CS—Československý Národní Komitet pro Vakuovou Fyziku, Techniku a Aplikace.
- D—Deutsche Arbeitsgemeinschaft Vakuum (DAGV).
- DDR—Nationale Kommission Vakuum/Grenzflächen/Dunne Schichten der DDR.
- E—Asociación Española del Vacío y sus Aplicaciones (ASEVA).
- F—Société Française du Vide (SFV).
- GB—British Vacuum Council (BVC).
- H—Nemzetközi Vakuumtechnikai Unió—Magyar Nemzeti Bizottsága.
- I—Associazione Italiana del Vuoto (AIV).
- IL—The Israel Society for Vacuum Technology (ISVT).
- IND—Indian Vacuum Society (IVS).
- J—Nihon Shinkuu Kyokai (NSK).
- MX—Sociedad Mexicana de Ciencia de Superficies y Vacío, AC (SMCSV).
- NL—Nederlandse Vacuumvereniging (NEVAC).
- PRC—Chinese Vacuum Society (CVS).

- P—Sociedade Portuguesa de Vácuo (SOPORVAC).
- PL—Polski Komitet Techniki Próźni i Technologii Elektronopróźnio Wych (PKTP i TEP).
- S—Svenska Vakuum Sällskapet (SVS).
- SF—Suomen Tyhjiöseura.
- USA—American Vacuum Society (AVS).
- YU—Zveza društva za vakuumsko tehniko Jugoslavije (JUVAK).

List of Presidents. International Organization for Vacuum Science and Technology (IOVST)—Organisation Internationale pour la Science et la Technique du Vide (OISTV)—Internationale Organisation für Vakuum-Physik und -Technik (IOVPT):

1958–1962 Prof Dr Emil Thomas (B).

The International Union for Vacuum Science, Technique and Applications (IUVSTA)—L’Union Internationale pour la Science, la Technique et les Applications du Vide (UISTAV)—Die Internationale Union für Vakuum-Forschung, -Technik und -Anwendung (IUVFTA):

- 1962–1965 Mr Medard W Welch (USA);
- 1965–1968 Prof Dr Jean Debiesse (F);
- 1968–1971 Prof Dr Kurt Diels (D);
- 1971–1974 Dr Luther E Preuss (USA);
- 1974–1977 Dr Albertus Venema (NL);
- 1977–1980 Prof Dr Leslie Holland (GB);
- 1980–1983 Dr James M Lafferty (USA);
- 1983–1986 Prof Dr János Antal (H);
- 1986–1989 Prof Dr h. c. Heribert Jahrreiss (D).

Honorary Presidents.

- 1962 Prof Dr L Dunoyer (F).
- 1962 Prof Dr M Pirani (GB).
- 1977 Mr M W Welch (USA).
- 1983 Prof Dr h. c. M Auwärter (FL).

Honorary and Founder Members of the Union.

- Mr A S D Barrett (GB).
- Mlle M Berthaud (F).
- Prof D Degras (F).
- Prof K Diels (D).
- Prof E Thomas (B).
- Dr A Venema (NL).
- Mr M W Welch (USA).

IUVSTA Scientific and Technical divisions

The Scientific and Technical Directorate (STD) coordinates the work of six divisions, as shown in Figure 4.

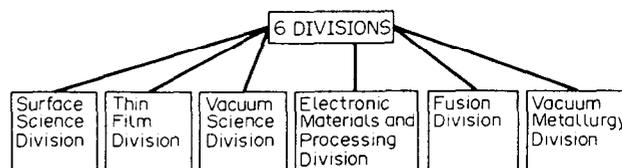


Figure 4. The six divisions of the STD.

Chairmen and members of divisions who are not EC members participate at EC sessions as observers with the right to speak but not vote.

The structure of each division is as shown in Figure 5.

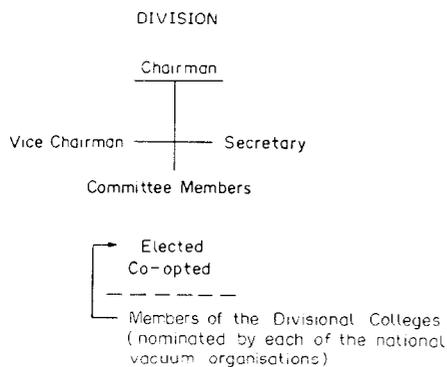


Figure 5. Structure of the divisions of the STD.

The six scientific and technical divisions of IUVSTA currently focus on member countries' major areas of interest. Divisional interests are described in general terms below.

Surface Science. Experimental and theoretical research on solid surfaces and interfaces as well as gas–solid interactions define in broad outline, the scope of this division. Current emphasis is on electron, ion, atom and photon interactions with surfaces and the structure, electronic properties and dynamics of surface processes including surface reactions, diffusion and catalysis.

Typical Surface Science Division topics at recent congresses include:

- theory of surfaces;
- catalysis;
- critical phenomena;
- surface dynamics, kinetics;
- vibrational spectroscopy;
- microscopy;
- photoemission; electronic structure;
- surface structure;
- solid–liquid interfaces;
- applied surface analysis;
- electron, ion, and atom scattering.

Thin Film. Devoted to the production and use of films from research to device and mechanical applications, the division's interests include preparation techniques, including new technologies, such as photon, electron and ion-enhanced deposition and processing, electrical and mechanical properties, process monitoring and analytical characterization methods. Interests extend to diffusion and electromigration, growth, structure, epitaxy, nucleation and chemical phenomena at thin film interfaces.

Typical Thin Film Division topics at recent congresses include:

- growth and physical properties of thin films;
- thin films for optical and magnetic recording;
- epitaxial films;
- thin film phenomena and reactions;
- multilayer films;
- laser, e-beam and ion-assisted processes;
- thin film sensors.

Vacuum Science. All phenomena impacting the production, measurement and analysis of vacuum are of prime concern. Permeability of materials, vacuum pumping, outgassing and contamination are within the division's purview, as are new leak detection techniques and improved total and partial pressure

measurements. Standards for these and other measurements are continually reviewed by the division.

Typical Vacuum Science Division topics at recent congresses include:

- vacuum physics and measurements;
- vacuum production and diagnostics including leak detection and residual gas analysis;
- applications of vacuum technology in space research, particle accelerators, fusion technology, plasma processing and surface science.

Electronic Materials and Processing. The science and technology pertaining to preparation, growth, processing and characterizing of the materials used in device fabrication are this division's concern. Typical interests include silicon and compound semiconductors, the structure of interfaces and their growth and processing, CVD and MBE deposition, e-beam photolithography, plasma and ion etching techniques, surface chemical behaviour, quantum well structures, opto-electronics, VLSI/sub-micron devices, interconnects and packaging.

Typical Electronic Materials and Processing Division topics at recent congresses include;

- fundamental mechanisms in dry etching;
- new developments in lithography for VLSI;
- fundamental properties of superlattices;
- applications of high speed semiconductor devices;
- metal/semiconductor interfaces;
- applications of opto-electronics;
- silicides and interconnects in VLSI;
- films—epitaxial growth, thin insulators;
- semiconductor surfaces;
- quantum well structures.

Fusion. This division's concerns include gas fuelling and pumping of large vacuum vessels; design and construction of such vessels, radioactive gas storage, recovery and handling; pressure measurement, leak testing and repair of plasma devices and fusion reactors including particle beam injection; plasma wall interactions; plasma diagnostics (magnetic confinement fusion (MCF) and inertial confinement fusion (ICF)); vacuum materials development; coatings, claddings, ceramics and alloys; ICF microtarget development; and neutral and negative ion beam injector technology.

Typical Fusion Division topics at recent congresses include:

- wall and limiter conditioning in large fusion devices;
- design aspects of next generation devices;
- recent advances in plasma diagnostics;
- vacuum material development;
- plasma–wall interactions;
- plasma impurity control and recycling;
- plasma fuelling and heating;
- microtarget fabrication and driver microtarget interactions;
- maintenance of large fusion devices;
- production and measurement of vacuum in fusion devices.

Vacuum Metallurgy. Processing and characteristics of metals under all subatmospheric conditions are this division's concern. This extends to vacuum induction; arc, e-beam, ion and plasma beam melting; vacuum heat treating and purification as well as the structure, properties, techniques and applications of thick

vacuum coatings in such areas as tribology, corrosion and high temperature oxidation.

Typical Vacuum Metallurgy Division topics at recent congresses include:

vacuum melting, refining and allied techniques;
metals recovery, powder processing and product characterization;
coatings for science and technology—tribology, corrosion, high temperature oxidation;
design of large scale vacuum processing equipment.

The interests of the one steering committee are also described in general terms below.

Applied Surface Science (Steering Committee). The application of the concepts and tools of surface science to problems in solid state physics/chemistry, and materials science and technology define the scope of this proposed division. Current emphasis is on characterization of surfaces and interfaces and the quantification of surface analyses.

Typical Applied Surface Science topics at the most recent congress included:

analysis of material surfaces and interfaces;
surface analysis of semiconductors, thin films and devices;
quantitative surface analysis—SNMS/SIMS/AES, XPS;
characterization of polymer surfaces;
characterization of surface modified materials;
surface analysis of fusion devices.

Thus, the interests of IUVSTA encompass not only vacuum per se, but those disciplines that use vacuum as an important tool. IUVSTA divisions coordinate and organize the technical programme of triennial International Vacuum Congresses and conferences sponsored by the Union (first started in Madrid in 1983). International Vacuum Congress sessions are divided on the basis of the Union's divisional structure and each division plays an important role in the selection of scientific papers, invited speakers and of moderators for these sessions. Divisions also work closely together with other divisions for co-sponsoring sessions where mutual interest on a technical topic occurs.

International Vacuum Congresses and other scientific events

The IUVSTA organizes an International Vacuum Congress (IVC) every 3 yr. Since 1971, this congress has been held in conjunction with the International Conference on Solid Surfaces (ICSS). The latest congress was held at Baltimore, MD, USA in October 1986, with nearly 1700 in attendance. The next congress is being planned for Cologne, FRG in September 1989. A list of past and future planned Congresses is given below.

International IUVSTA Vacuum Congresses

1958 Namur (B).
1961 Washington, DC (USA).
1965 Stuttgart (D).
1968 Manchester (GB).
1971 Boston, MA (USA).
1974 Kyoto (J).
1977 Vienna (A).
1980 Cannes (F).
1983 Madrid (E).

1986 Baltimore, MD (USA).
1989 Cologne (D).
1992 Rio de Janeiro (BR).

The IUVSTA also serves as a 'clearing house' for the organization of international congresses and conferences on vacuum and related fields by granting sponsorship for these meetings. The formalities of the sponsorship requests are handled by the Secretary General, but divisional approval is also required. The purpose of the sponsorship is to avoid date conflicts and to coordinate international meetings in fields of interest to the Union. Sponsorship for the advancement of international science have been granted for many congresses, symposia, meetings, workshops and summer schools.

IUVSTA education programme

IUVSTA, through its Education Committee, promotes vacuum education by developing and making available a set of visual aid materials at minimal cost (currently 550 SF) in the form of 35 mm transparencies with appropriate explanatory text material in five parts covering fundamentals of vacuum, vacuum measurement and gauges, gas transfer pumps, residual gas analysers and capture pumps, and vacuum deposition. The series is available as a complete set or the individual parts may be purchased separately. The text is presently available in English, but translations into French, German, Spanish and possibly other languages are in progress. Additional subjects to be covered are vacuum materials, leak detection and vacuum history. For further information, contact the IUVSTA Education Committee Chairman, L P Andersson, Electronic Design Department, Bofors Aerotronics AB, S-181 81 Lidingö, Sweden.

Another activity of the Union is the planning of training courses and suggesting instructors for vacuum education in developing countries. This is done by the Liaison Committee working with UNESCO.

IUVSTA publications

The IUVSTA publishes a quarterly *News Bulletin* that is sent to its member national committees and others to inform them of the activities of the Executive Council and the divisions. It also contains a calendar of events and other articles of international interest. Subscription information may be obtained from Nancy L Hammond, AVS Executive Secretary, 335 East 45th Street, New York, NY 10017, USA.

Since 1984, the American Vacuum Society has handled the publication and mailing of the *News Bulletin* at cost from their office in New York to take advantage of the large scale automated publication facilities of the American Institute of Physics.

IUVSTA International Scholarships

To support younger scientists working abroad, the M W Welch International Scholarship was founded in 1965. This was brought about by M W Welch's financial support and proposal to the IUVSTA Executive Council for scholarship support for post-graduate study in vacuum science and technology. The American Vacuum Society would be the custodian of the funds and \$5000 would be advanced each year to the IUVSTA on the acceptance of a satisfactory protocol describing selection of scholars. To recognize M W Welch for his efforts and support in this matter,

IUVSTA formed the 'M W Welch Foundation' for administration of this scholarship. The M W Welch foundation was organized by the Scientific and Technical Directorate, in association with the Education Committee and the Scientific Secretariat located in Paris. The first equivalences of diplomas were set up with the help of UNESCO. A protocol was accepted in 1966 and the first scholar was chosen in 1968. A scholar has been selected each year since then and the Welch family has continued to advance money annually to support the scholarship. The amount of the scholarship was increased to \$7000 in 1975 and to \$10 000 in 1985. In 1974, when M C Berthaud left the Scientific Secretary charge, all administrative chores associated with the Welch Scholarship were transferred to the Executive Secretariat established in London in 1971. On the demise of the secretariat in 1980, for economic reasons, the administrative work was finally transferred to the AVS and is now managed by a Scholarship Administrator, W D Westwood. Under the present protocol, revised in 1980, the Scholarship Administrator is responsible to the Welch Foundation consisting of the Director of the Scientific and Technical Directorate of the IUVSTA who serves as ex-officio chairman and four 'Welch Scholarship Trustees' elected by the Executive Council and in addition a Treasurer of the Foundation and, ex-officio, the Scientific and Technical Secretary and the Treasurer of the Union. The organizational structure of the M W Welch Foundation is as shown in Figure 6. A list of the Welch Scholars is given in Table 1.

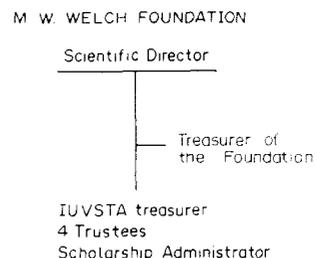


Figure 6. Organizational structure of the M W Welch Foundation.

M W Welch Foundation—1988

Scientific Director: A Van Oostrom (NL).
Scientific and Technical Secretary: S-E Karlsson (S).
Scholarship Treasurer: R Whetten (USA).
IUVSTA Treasurer (ex-officio): J Hengevoss (CH).
Elected Members (Trustees): (years indicated are expiration dates of current members) A Calcatelli, I (1988); J L Robins, AUS (1989); K L Chopra, IND (1990); L E Preuss, USA (1991).
Administrator: W D Westwood (CN).
 IUVSTA scholarship application forms may be obtained from its administrator, Dr W D Westwood, Bell Northern Research Ltd, PO Box 3511-Station C, Ottawa, Ontario, Canada K1Y 4H7. Deadline for application for a given year is mid-April of the preceding year.

Table 1. List of Welch Scholars

Year	Name	Age (yr)	Country of origin	Term of Fellowship spent in
1969	J Lopez-Sancho	25	Spain	USA
1970	M Vesely	26	Czechoslovakia	USA
1971	S Tabata	44	Japan	France
1972	E Rieger	40	Hungary	Netherlands
1973	J Czyzewski	30	Poland	USA
1974	O Christensen		Denmark	France
1975	S Ojha	27	India	USA
1976	H Urbankova	28	Czechoslovakia	USA
1977	H Kezuka	29	Japan	Germany
1978	L Verheij	32	Netherlands	UK
1979	P Cohen	32	USA	Not used
1980	J Kolaczkiwicz	33	Poland	Germany
1981	C Dharmadhikari	31	India	USA
1982	P Dowben	27	USA	Germany
1983	A Ciszewski	34	Poland	USA
1984	C Foley	26	Australia	USA
1985	J Paul		Sweden	UK
1986	Y Gao		China	France
1987	S Sahu		India	Australia
1988	G Sundaram		USA	UK