

EFSUMB History of Ultrasound

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Israel

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We acknowledge the Israel Ultrasound pioneers, founders of the Israel Society of Ultrasound



The Israel Society of Ultrasound in Medicine

The Israel Society of Ultrasound in Medicine (ISDUM) was founded 36 years ago (1984) by three local pioneers in Ultrasound: Prof. Y. Yitzchak, Prof. J. K. Kaftori and Dr. H. Zackut, with the collaboration of Prof. Barry Goldberg, Head of the Ultrasound unit at the Thomas Jefferson University Hospital in Philadelphia, USA. The new Society was integrated in the frame of the Israel Radiological Society (ISRA), joining the disciplines involved in the practice of Ultrasound in Medicine. ISRA was founded in 1927, 21 years before the establishment of the State of Israel (1).

Diagnostic ultrasound both in Israel and abroad is divided into four main categories: Obstetrics/Gynecology, Vascular, Echocardiography, and Abdominal/General. At the beginning, ISDUM included both General and Obstetrics/Gynecology Ultrasound. Later on, the Israel Society of Ultrasound in Obstetrics and Gynecology was founded and split off from the original Ultrasound Society. ISDUM members include Radiologists interested in the field of Ultrasound and Ultrasound Technicians. Unlike in America, in Israel, technicians wishing to work in general ultrasound must first complete studies as an X-ray technologist and then receive “cross-training” in general ultrasound. ISDUM has currently about 120 members. Our society is a member of the European Federation for Ultrasound in Medicine and Biology (EFSUMB). (2). ISDUM organizes an Annual Conference on the name of Professor Barry Goldberg (Fig 1), developed by local and foreign invited speakers. The first Annual Meeting of ISDUM was held on 1984, with the presence of Barry Goldberg as the invited speaker (Fig 1). In addition, two one-day courses in between are held, dedicated to specific topics. Residents and senior radiologists, ultrasound technicians, and physicians from other specialists, who are involved in the practice of Ultrasound, assist the Annual conference and the bi-annual courses.

Figure 1 Professor Barry Goldberg, Philadelphia, disserting at the first Annual Meeting ISDUM in his name, 1984.



ISDUM has organized several International events in Israel. In 1990 we were able to host the yearly congress of the European Society of Ultrasound in Medicine, the Euroson 90, in the National Buildings in Jerusalem in May 6-11 with many participants. At that meeting, Prof Francis Weill from France was our invited speaker (Fig. 2).

Figure 2 Invitations to social activities at Euroson 1990 Meeting, held in Jerusalem.





In 2013, an Ultrasound School on Emergency Ultrasound was held in Tel Aviv, hosted by ISDUM and WINFOCUS (World Interactive Network Focused on Critical Ultrasound) (Fig 3). WINFOCUS courses have been designed to disseminate and develop Point-of-Care Ultrasound practice, research, education, technology and networking worldwide. The joint WINFOCUS and ISDUM workshop was delivered on Basic Ultrasound in Primary, Emergency and Critical Care. This was in according to an entry module for the WINFOCUS International "Ultrasound Life Support- Basic Level 1 Provider" certification.

Figure 3 EUROSON School on Emergency Ultrasound, Tel Aviv, 2013.



Israel had the honor to be chosen as the meeting place for the EUROSON 2014. EUROSON 2014, the 26th Congress of the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) was held in Tel Aviv, hosted by ISDUM (Fig 4).

Figure 4 26th Annual Congress of the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) held in Tel Aviv, 2014.



In 2017 the 27th International Musculoskeletal Ultrasound Conference hosted by the Musculoskeletal Ultrasound Society (MUSOC), the Israel Society for Diagnostic Ultrasound in Medicine (ISDUM), the Israel Society of Rheumatology and the Israel Society of Orthopedic Surgeons was held in Tel Aviv (Fig 5).

Figure 5 27th International Musculoskeletal Ultrasound Conference hosted by the Musculoskeletal Ultrasound Society (MUSOC), the Israel Society for Diagnostic Ultrasound in Medicine (ISDUM), the Israel Society of Rheumatology and the Israel Society of Orthopedic Surgeons, held in Tel Aviv, 2017.



Educational lectures focused on US anatomy and pathology, live demonstration and hands-on workshops delivered by world class International Faculty, as well as a poster exhibition and an extensive technical exhibition were offered at these international events. In 2018, the World Federation of Societies of Ultrasound in Medicine and Biology (WFSUMB)

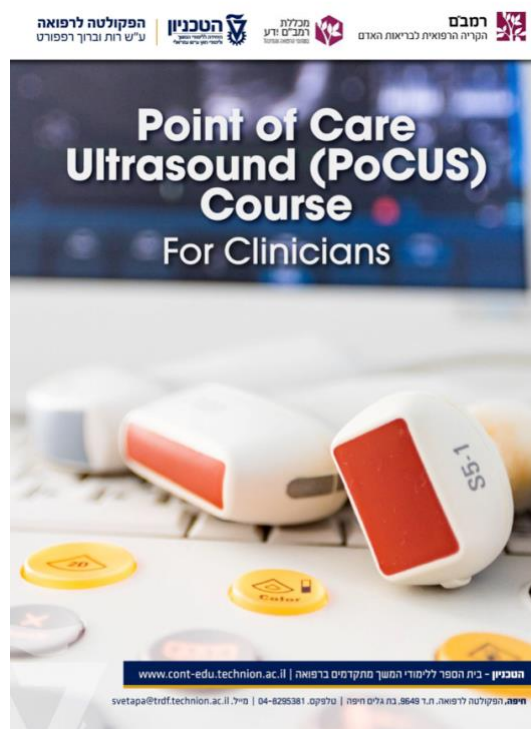
Executive Board joined ISDUM at a meeting held in Jerusalem (Fig 6). The Executive Board members delivered the lectures at the event.

Figure 6 **Joined WFUMB Executive board and ISDUM Meeting, Orient Hotel, Jerusalem, 2018.**



Point of Care Ultrasound courses for clinicians and surgeons are held bi-annually since 2014 at Rambam Medical Center and Technion University in Haifa. A postgraduate Technion course has been held since 2019 (Fig 7).

Figure 7 **Post graduate Technion-Rambam course on Point of Care Ultrasound for clinicians, held bi-annually.**



Ultrasound Units in the Radiological Departments were raised from the last seventies at every hospital and rapidly extended to out patients clinics. An Israel technological company named Elscint locally produced the most common ultrasound equipment. As a closing of the Israel Ultrasound history, we are pleased to include the live history as related by the Father of Ultrasound in Israel, Prof. Yacov Itzchak, December 2020: "The Establishment of The Israel Society of Ultrasound in Medicine". "It's an honor and privilege for me Yacov Itzchak, M.D., Ph.D., Professor Emeritus, of Faculty of Medicine, Tel Aviv University, and the first President of the Israel Society of Ultrasound in Medicine for the first ten years. My first meeting with clinical Ultrasound occurred during the summer of 1975 while I was on a sabbatical period in Yale University, School of Medicine, Department of Radiology, New Haven, I was introduced for the first time to an Ultrasound system performing clinical imaging examination of the body. In that summer joined the Department in New Haven Dr. Kenneth J. W. Taylor a specialist in Body Ultrasound from England. At first when I heard of the Ultrasound system I had some questions as did some other Radiologists in the department, about the diagnostic abilities of the system, and I asked for a meeting with Dr. Taylor. In our first meeting Dr. Taylor's enthusiasm from the technology was great and he invited me to join a course that he was opening. I must confess that my hesitation subsided as he continued to talk. I joined

the course and after six weeks I became a believer of the technology. It became clear to me that I have to convince my Head of Imaging Department at the Sheba Medical Center in Tel Hashomer, Prof. Victor Deutch, may he rest in peace, as well as the Director of the Hospital, Prof. M. Shani that Ultrasound examinations are the future of Diagnostic Imaging. The C.T. technique was in that time, in his first steps and it seemed to me that Ultrasound contribution was more accepted. As the year ended and the more I was exposed to Ultrasound examinations ability, I succeeded convincing my Director of the Imaging department and the Director of the Hospital to purchase the first Ultrasound system B-Mode by Picker Company and to start a new diagnostic path in our hospital. It was clear to me that we will have to build a program of teaching and education for radiology technicians and doctors that will be able to run the technology. While in Yale there were five systems working in full capacity, I was promised that the Sheba hospital would purchase two Ultrasound systems in the future. In the remaining time of my sabbatical I dedicated myself to study the technology and its ability to perform examinations. At that same time Professor Victor Deutch, may he rest in peace, the head of the Radiology Department at the Sheba Medical Center, recommended that I will collect instruction material for teaching our medical staff. In 1977 I returned to Israel after finishing my sabbatical and started organizing the Ultrasound Unit in the Diagnostic Imaging Department in the Sheba Medical Center in Tel Hashomer, acting as the technician as well as the radiologist operating the system. At the same time I started practical teaching two senior X-ray technicians from our staff. To my surprise during 2 weeks of working with B. Mode transducer they were able to perform most of the examinations of upper abdomen, very enthusiastic to reveal the inner anatomy of the abdomen. After three months of working we purchased a second system by Unirad and 3 more technicians were taught how to perform body U.S, and at the same time we were searching for sector scan to perform in real time for vascular studies and biopsies. In 1978 we purchased the 10Meg. Real time by Picker Co., that allowed us to perform High Resolution examinations and biopsies in real time of the Thyroid and superficial organs of the body, small joints and tendons. In 1980 we started organizing Ultrasound in Medicine meeting in which we invited Radiologists and X-ray Technicians that were working with Ultrasound Systems. Ultrasound Systems at that time were already in almost every hospital in the Country as well as in private clinics. With the help of our American and European friends that were members in Ultrasound societies in Europe and America, we started a 60-

hour course in abdominal Ultrasound in our institution, twice a week in the afternoon where many radiologists from most hospitals participated. We were helped in organizing the course by radiologists that came back from their sabbatical in America: Prof. Ruth Shilo, may she rest in peace, from Ichilov Medical Center, who had her sabbatical in Philadelphia with Professor Barry B. Goldberg, and Professor Joseph Kaftori who had his fellowship in Boston in 1978. Together we created the first seed of radiologists that performed body ultrasound examinations and started adding academic lectures in ultrasound in the annual meeting of the Radiology Society in Israel as well as inviting guest lecturers from abroad. The year of revolution was 1983 when it was decided to establish the Ultrasound Society in Medicine as a part of the Israel Society of Radiology. That was the first meeting when we declared of the establishment of The Israel Society of Ultrasound in Medicine. We had meetings with the Dean of the Faculty of Medicine in Tel Aviv University and a lot of help from Prof. Shor, May he rest in peace, who was the Dean of Radiology Imaging Faculty and the Faculty of medicine agreed to sponsor our annual meetings, and mentioning a dedicated lecture The Yearly Barry B. Goldberg Lecture, who was helping us with his experience and advice how to establish the society and recruiting famous lecturers to the annual meetings. The first meeting of the new Society was held in Jerusalem at the Daniel Hotel in May 1983. The Israel Society was accepted by the European Society of Ultrasound with full privileges. Since the establishment of the Israel Ultrasound Society in Medicine I was chosen by the members of the society to be the Chairman, a position I held till 1994. In that year it was Prof. Moshe Graif, may he rest in peace, who became the Chairman. On 1999, Prof. Simon Strauss was elected as Chairman (Fig 8). Prof. Diana Gaitini replaced him on 2002 and Dr. Liat Appelbaum is the actual Head of the Society since 2015".

Figure 8 The three first ISDUM Presidents. Prof. Yakov Itzchak in the middle, Prof. Moshe Graif, RIP, embraced by his left arm and Prof. Simon Strauss, to his right.



Israel Ultrasound Technological Developments

Elscint

Haifa-based "Elscint" company, was founded in 1969 by Dr. Avraham Suhami, who was a Nuclear Physics professor at the Technion – Israel Institute of Technology (2) The name may be a portmanteau of "electronic" and "scientific, or more likely of "El" as in "El Al", and "Scint", as in scintillation, referring to the type of radiation detector used in Nuclear Medicine as in Elscint's first products. Elscint was an Israeli technology company that developed, manufactured and sold medical imaging equipment, including Ultrasound, Nuclear Medicine, Computed Tomography, Magnetic Resonance Imaging and X-ray scanners. Elscint's shares traded on the NASDAQ as well as on the Tel Aviv Stock Exchange. In 1972, Elscint became the first Israeli company to list on the NASDAQ (3). At its height, Elscint was a world leader in the development of medical imaging technologies that was considered the pride of the medical industry in Israel in the 90's. Most of Elscint's activities were sold to GE Healthcare and Philips Medical Systems (4). GE Healthcare's branch in Israel is, in fact, the main remnant of Elscint. In contrast to most of the medical instrumentation companies established in Israel, Elscint was not sold in its early stages and did not fold within several years because of a cash shortage. The CT, MRI, Nuclear Medicine and Ultrasound technology invented by Elscint survive and are developed by GE Healthcare, Philips Medical and Insight and even the employees have remained.

Transvaginal ultrasound probe

The worldwide use of the transvaginal-scanning route has revolutionized obstetrical and gynecologic imaging resulting in the now well-known field of transvaginal sonography, after long, slow, and at times challenging aspects of its acceptance by the obstetrical and gynecologic community. Dedicated physicians in the Department of Obstetrics and Gynecology at Rambam Medical Center, Haifa, Israel, have been pioneers in conceiving and then collaborating with an Israeli manufacturer in the construction and worldwide use of the transvaginal ultrasound probe (6, 7). The transvaginal probe, completed with a needle guide attachment for transvaginal puncture procedures, was mass-produced by Elscint (Fig 9).

Figure 9 The First Elscint Transvaginal Ultrasound Probe.

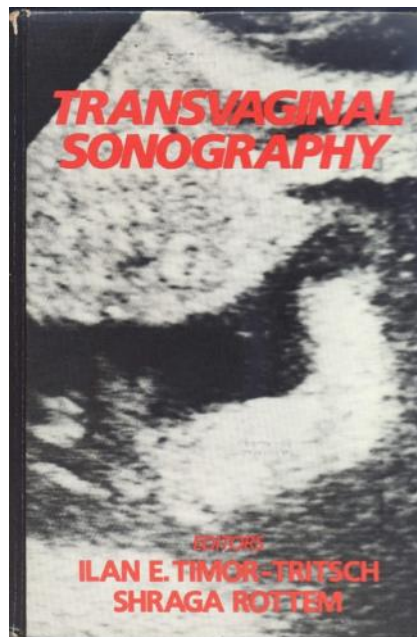


Although some other companies in the world started to produce and market their own transvaginal transducers, the high resolution of the Elscint probe, analog at that time, provided ultrasound images clearly superior in quality, surpassing even those utilizing the new, digital imaging transducer technology (5)

As this technique caught, Timor-Tritsch I.E. and his colleague Rotem S decided to compile more than a dozen of the more noteworthy articles that dealt with the—then—new uses for the transvaginal ultrasound probe. The result was the first book on the subject, entitled *Transvaginal Sonography*, published in 1987 (Fig 10). Each chapter was written by

members of the staff at Rambam's Department of Obstetrics/Gynecology, Haifa, Israel. Encouraged by the interest of obstetricians and gynecologists worldwide in their first edition, they published the second edition in 1991.

Figure 10 The First Edition of the book *Transvaginal Ultrasound* by Timor-Tritsch and Shrager Rottem (1987).



MedSim's

Experts in aviation simulation technology, medicine and education founded MedSim's, an Israeli company dedicated to Ultrasound Training and Simulation. The Ultrasound Simulator named Ultrasim allows students/residents and healthcare providers to practice performing sonographic examinations on a mannequin while viewing real-time sonographic images, improving diagnostic skills, advancing their level of medical knowledge and clinical performance. The full-size mannequins provide realistic body contours and soft, pliable sections in the areas to be scanned (Fig 11). Ultrasim has been installed in over 425 centers worldwide. UltraSim® is a complete system simulator with B-mode, Color and Spectral Doppler modes and an intuitively designed, generic control panel. The probes do not emit ultrasound energy, as they are 3D position sensors that tell the UltraSim® computer the position and angle at which the body volume is being scanned. The simulator provides all of

the necessary clinical data as well as a detailed case analysis for each patient case. These capabilities help learn how to prepare a complete patient workup. Other training features allow the educator to easily monitor and evaluate the student's/resident's progress (8).

Figure 11 MedSim's US simulator.



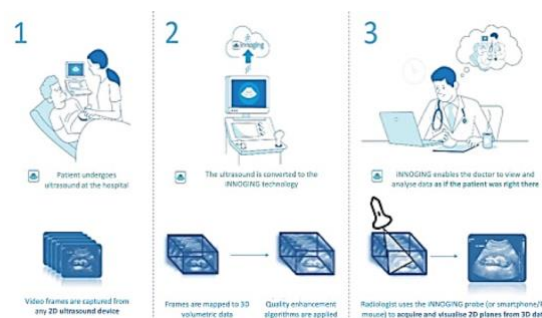
Patient cases are available in Education Modules such as Abdomen, Obstetrics, Gynecology, Transvaginal Gynecology, Transvaginal Obstetrics, Breast, Vascular, Neck and Emergency Medicine.

iNNOGING

iNNOGING- Remote and Offline Ultrasound Image Analysis Platform is an Israeli startup spun off in 2017, co-funded by the Horizon 2020 program of the European Union. iNNOGING developed a breakthrough technology that enables physicians to manipulate captured ultrasound video and perform a virtual remote dynamic exam and an accurate diagnosis based on recorded examinations from any ultrasound device (9). Radiologists and physicians can interact dynamically with ultrasound scans, on any computer on anytime. iNNOGING improves clinical diagnoses and reduces unnecessary follow-up exams. iNNOGING Medical is developing a remote offline tool for radiologists to inspect areas of interest based on recorded ultrasound scans (Fig 12). The iNNOGING platform allows navigation in real time as if the patient was there, while all possible information on an organ is visible at any plane, even providing information that was not detected in the original scan.

The company has also launched an affordable SaaS-based ultrasound simulator. iNNOGING Medical company is working to have a Lung's Research (COVID- related) offering a solution which will enable the pulmonologists to remotely view the ultrasound scans, after the patient is no longer present or the physician has already left the Covid's department. Any medical team member with basic training can do the ultrasound scan, avoiding exposure of expert medical staff to Covid's patients.

Figure 12 iNNOGING process.



PulseNmore

Israeli startup PulseNmore was founded in 2015. In 2018, it was in the final stages of developing a handheld telemedicine device docked with the patient's smartphone that would allow pregnant women to perform a fetal ultrasound scan (Fig 13). The device was officially launched on 2020. It delivers high quality images that can be created anywhere, stored and forwarded for clinical review or shared in an online consultation. The device is intended to determine the vitality of the fetus and is not intended to replace scans for detection fetal defects, which are typically performed at clinics or hospitals. PulseNmore connected at-home ultrasound may improve convenience and efficiency beyond traditional in-facility imaging. Just a couple years later, the world is in midst of a devastating global health crisis. Patients mostly avoid hospitals and clinics visits for nonessential medical, surgical, and dental procedures, for fear of contracting the novel coronavirus (10). This makes a portable device like PulseNmore, a way for pregnant women to get frequent checkups, allowing them to stay home for up to half of their prenatal visits. The device can

be used in an online mode via video-conferencing applications to replace a scheduled pregnancy ultrasound scan.

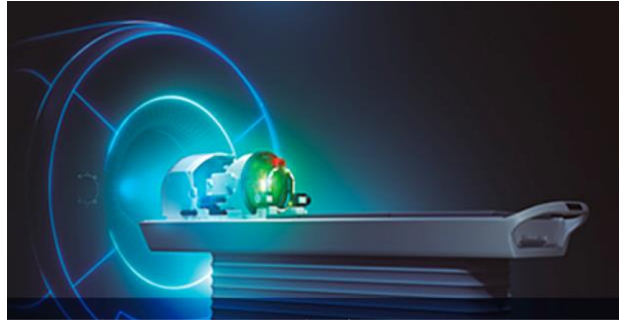
Figure 13 **PulseNmore. Handheld home Ultrasound device.**



Insightec

INSIGHTEC is an Israel based medical device company that developed MR guided Focused Ultrasound Acoustic Surgery technology, allowing destroying deep tissue in the body and brain without the need for surgery (Fig 14). The company was founded in 1999 by Jacob Vortman, an Electrical Engineering, and Oded Tamir, Economic and Business Manager, both previously serving as President and COO respectively, at Elbit Medical Imaging, and Israel based company. Insightec was founded with seed investment from Elbit Medical Imaging, and GE Healthcare. MR guided Focused Ultrasound is used for thermal ablation of targets in the body and brain by heat induced focusing using ultrasound energy under full MR planning and thermal imaging control. The technology is applied for the treatment of untreatable pain from metastatic bone metastases, uterine fibroids, prostatic cancer, neurological disorders (Essential Tremors, Tremor Dominant idiopathic Parkinson's Disease-Unilateral) focusing in thalamus, sub thalamus and pallidum regions in the brain, and neuropathic pain (11-13).

Figure 14 **MRI guided Ultrasound Focused Technology.**



Magnetic resonance-guided focused ultrasound (MRgFUS) technology uses MRI imaging to guide high-powered, focused ultrasound to a very small point. At that point, molecules are vibrated extremely quickly, which creates intense local heat. That heat can “cook” tissue and destroy it. MRgFUS allows clinicians to target a very specific focal point – with very little heating produced in front of and behind that point, so only the targeted tissue is affected (12).

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