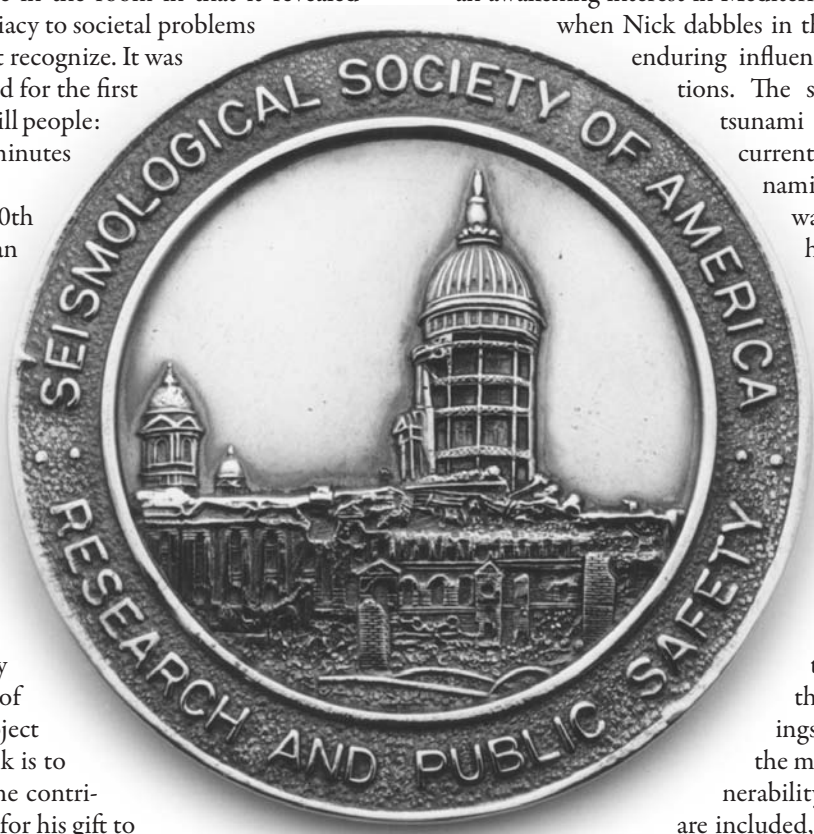
Harry Fielding Reid Medal Citation for Nicholas Ambraseys

It is my pleasant duty to relate a brief account of Nick's contribution to the subject of seismology. His absence from this award ceremony makes it easier for me to undertake, since he would surely blush from the well-deserved praise that I am about to lavish upon him.

In 1968 Nick Ambraseys gave a lecture in Cambridge that electrified an audience of geophysicists. In 50 short minutes he demonstrated links between engineering and history, earthquakes and civilization, and scientists and society. His talk was an inspiration to everyone in the room in that it revealed that science has an immediacy to societal problems that many scientists do not recognize. It was during this talk that I heard for the first time, "Earthquakes don't kill people: buildings do." Those 50 minutes changed my life.



Yesterday was the 100th anniversary of the San Francisco earthquake. Many feel this to be a turning point in the study of all earthquakes largely because of the discerning conclusions of Harry Reid, after whom the Society's medal is named. Some people at this meeting may be under the impression that the 1906 earthquake initiated not only the Seismological Society of America but the very subject of seismology itself. If Nick is to be remembered for any one contribution, however, it will be for his gift to the world, a multimillennia seismic record that extends back to the very beginnings of the written word. Almost single-handedly he has demonstrated that 100 years is an absurdly short interval of time to form definitive conclusions about the time history of earthquakes.

In 1958, at the age of 29, Nick joined the staff of Imperial College London, having obtained his initial degree from National Technical University, Athens (1952) and a Ph.D. in civil engineering specializing in soil mechanics at Imperial College. He taught at the University of Illinois in Urbana in Nate Newmark's days and spent some time with WES at Vicksburg. In 1968 he established the Engineering Seismology Unit there, which he led between 1971 and 1994, for the first three years as a reader and subsequently as a professor of engineering. During his time at Imperial College he led more than 30 United Nations field missions throughout the world. He has received many honors from learned societies throughout his career, and is a fellow of the Royal Academy of Engineering, the European Academy, and the Academy of Athens.

Prior to becoming an academic, Nick had served in the Royal Hellenic Navy. This may have influenced his choice of scientific career because following some mid-century contributions to hydrodynamics, his articles in the 1960s demonstrate an awakening interest in Mediterranean tsunamis. As is usual when Nick dabbles in things, he has a seminal and enduring influence on all future investigations. The six-level Sieberg-Ambraseys tsunami scale described in 1962 is currently in general use in the tsunami community today. In the watery world of seaquakes it has the same importance that the Mercalli or MSK scales have in seismic-intensity investigations on land.

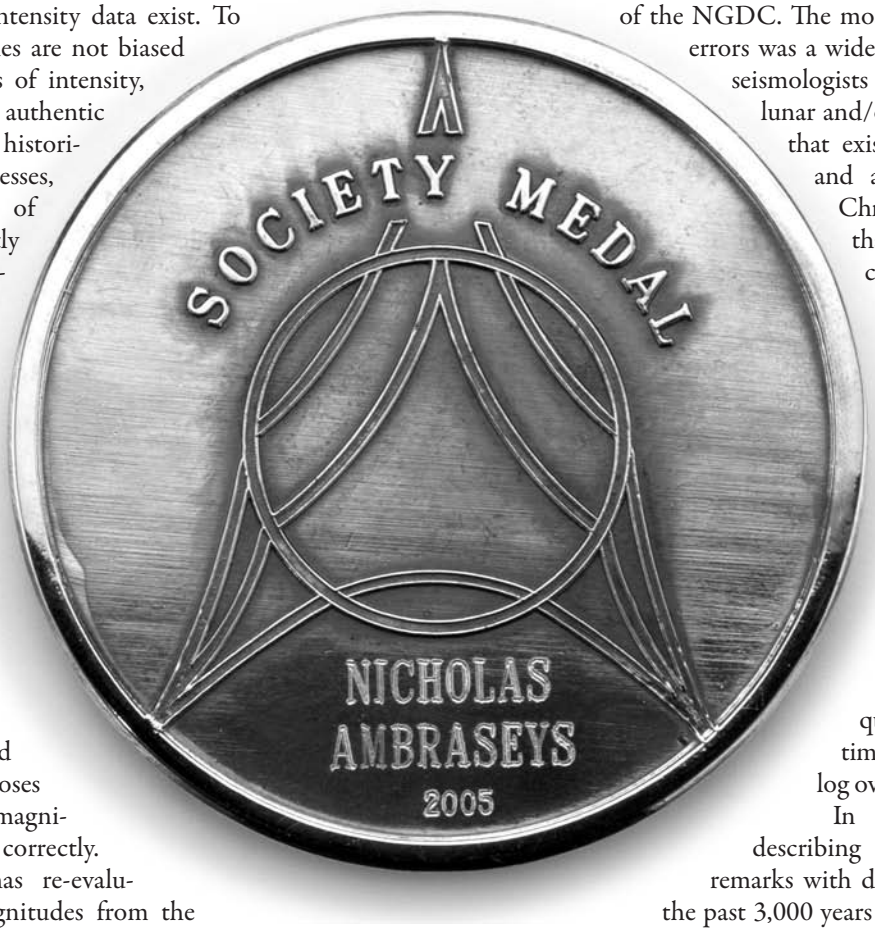
For the study of earthquakes in Iran he and [C. P.] Melville developed a special five-level intensity scale because existing intensity scales were inappropriate for characterizing damage to historic structures there. He notes that the traditional style of buildings in northern India saturates the more recent MSK scale if vulnerability and liquefaction features are included, requiring a modified MSK to be defined to assign intensities to 19th-century and earlier felt reports.

His engineering reports for the UN established a new standard for post-seismic studies, blending descriptions of engineering damage with mapping geological ruptures and liquefaction. His 1969 observations and theory of the physics of liquefaction and its effects on engineered structures may have been the first to recognize the delay between shaking and the onset of liquefaction.

He has actively pursued the collection of strong-motion data for recent earthquakes and, as project coordinator to a European commission, issued in 2004 a two-volume CD of European records for engineering and academic studies. He has also agitated extensively for the preservation of early seismic

records, many having being destroyed quite recently by librarians unaware of their historical importance.

His attempts to quantify the magnitudes of pre-instrumental earthquakes are based on establishing a regional link between intensity data observed for instrumentally recorded earthquakes, for which Ms and Mw have been calculated, and then applying these empirical relationships to historical data for which only intensity data exist. To ensure that these studies are not biased by careless assessments of intensity, he invariably returns to authentic accounts for recent and historical earthquakes and assesses, sometimes, hundreds of accounts independently of published interpretations.



Noting the importance of unbiased contouring of sparse intensity data, he has recently explored numerical kriging methods in an attempt to evaluate isoseismal areas objectively.

The essential link between instrumental magnitude and felt intensity presupposes that published early magnitudes were calculated correctly. In many cases he has re-evaluated instrumental magnitudes from the early seismograms. In more than one case he has found blunders and errors. For example, in reading through Gutenberg's original notes he was able to identify a rounding error that lead Richter to enter the Kangra 1905 earthquake as a Ms=8.0 event. The original seismograms, supplemented by many unavailable to Gutenberg, confirmed it to be Ms=7.8. This error is only one of many that haunt the numerous catalogs of later authors who have incorporated Gutenberg and Richter's catalog uncritically.

This brings me to Nick's most enduring contribution to earthquake studies.

It is not quite clear when Nick initiated his monumental quest to unravel the worldwide historical earthquake catalog, but its early beginnings are found in three papers on earthquakes in Tunis, Southwest Asia, and Cyprus in the early 1960s. Before that time, the historical catalogs of earthquakes were expanded by concatenating new materials to preceding compilations. Each new author added to the historical catalog as new events were discovered. Thus Robert Mallet's 1860 catalogs were compiled from Greek, Hebrew, Aramaic, and Latin classicists, including monastic records through the middle ages and dark ages, and accounts from crusaders, travelers, and newssheets when these became available. Successive updates of these lists of earthquakes added new earthquakes quite uncritically. Existing errors in the previous catalogs were rarely detected or corrected, and new errors were included. Many of these errors persist in current catalogs like the GSHAP or the Significant Earthquake catalog of the NGDC. The most extraordinary of these errors was a widespread ignorance among seismologists of the vastly different lunar and/or religious chronologies that exist in different countries and at different times past. Chronological errors mean that the same earthquake can appear in the catalog several times. In a notable article discussing errors in Willis's catalog of earthquakes in Palestine, he shows how Arabic dates were mistakenly entered as common era dates, with or without the 18th-century Gregorian correction, causing some pre-18th-century earthquakes to appear four times in the historical catalog over a range of 550 years!

In a 1972 *Nature* article describing these problems, Nick remarks with disarming modesty about the past 3,000 years of earthquakes, "I therefore decided to make my own catalog." His proposed catalog would contain only authentic accounts and would include no secondary data from previous earthquake lists. For more than 40 years, Nick has been reading accounts in ancient tomes, in civil archives, in travelers' diaries, in all the great libraries of the world to complete this massive task. To undertake this compilation he brings a gift of languages that few other seismologists can boast. For those languages he has not mastered he has an army of contacts in the world of languages with whom he works closely. As an example, he has recently collaborated with Tibetan experts to unravel some of the earthquakes of southern Tibet and the Himalaya.

His articles on historical seismicity and archaeoseismicity have vexed the editors and typesetters of a dozen journals since they baffle and challenge any simple citation method. Only the brave editor will attempt to meddle with his tripartite separation of normal citations from folio manuscripts, in variegated scripts, newspapers, and government files. It takes an even braver editor to insist that the titles of European articles in French or German or Dutch require translation into English.

On learning of the recent loss of the Baghdad library he was saddened and genuinely dismayed, having spent many weeks reading its irreplaceable and now lost manuscripts. On learning that the Royal Geographical Society had cancelled all borrower's privileges, he felt the discipline of geography had finally died.

His catalog is not yet complete. It advances by assigning each new earthquake to a separate sheet of paper with a precise date and time. To this paper are glued or typed such information as materializes over the years, supplemented occasionally by new materials, calculations, or intensity assessments. Two rooms of his Putney home are lined floor to ceiling with authentic accounts for this growing catalog.

The products of these years of research are of course legendary. He has published revised catalogs for the historical earthquakes of Iran, Europe, Iceland, Turkey, Afghanistan, India, Africa, and Middle America. It was he who first identified the 20th-century North Anatolian sequence and showed that such sequences alternate between the eastern and northern Anatolian faults over many hundreds of years, both supporting the importance of sequential triggering and ironically undermining the inherent simplicity of paleoseismic trench studies that were not to develop for a decade after this finding was published. His own words are a tribute to the thoroughness of his studies and provide concerns to any seismologist attempting to forecast future trends from the instrumental record: "The pattern of seismic activity of many areas is seen to have changed little over the past 2,500 years, while other areas which are at present quiescent can be shown to be capable of generating earthquakes of significant size."

I sometimes try to imagine what the historical catalog would be without Nick's jump-start. Gavin Newsom, the mayor of San Francisco, speaking of earthquake preparedness during an inaugural speech at this week's meeting, asserted that success was not a result, but a direction. Nick has established not only a new field, the study of historical earthquakes, he is a polymath who has defined its direction: authentic written accounts, no secondary materials, no entries from earlier catalogs, cross correlations to extant archeology, be wary of exaggeration, assess local building vulnerability, verify chronologies, and be critical of conflation or repetition. The numerous imitators that have now adopted his methods are continuing this tradition on a broad base of newly found historical materials. In particular the historians of Europe have started to exhume the tens of kilometers of archives and other important historical sources that have survived the centuries. The ultimate gold mines of ancient earthquakes that have yet to be exploited are the Ottoman and Vatican archives, the latter currently veiled from secular study.

But it would be misleading to think that his output is one entirely based on historical studies. He has authored and coauthored numerous articles on earthquake engineering, seismological theory, the design and vulnerability of large dams, with contributions to scaling laws and the significance of moment release. His 300+ articles and several books indicate that he has certainly written more words in more languages than many of us. Some of his seismological histories have recently been reissued in paperback form.

A few days after completing my rather dull Ph.D. in Cambridge in 1970, I visited Nick in Imperial College and asked him whom I should visit in Europe had I a spare month. He jotted down a list of some 20 earthquake engineers and seismologists with phone numbers for this naive young man, and what he should learn from them should he find them at home. I set off on the Orient Express with that remarkable list of Bulgarian, French, German, Czech, Yugoslavian, Greek, and Turkish seismologists and found doors opened wide to anyone who was a friend of Nick Ambraseys. When I returned he asked endless questions concerning everything I had encountered. I have never forgotten this kindness to a young student who was so obviously clueless and ignorant.

Now, three decades later, I find myself in possession of two boxes of legendary Ambraseys reprints, a fraction of his total output. I visit him, like other colleagues, and an hour's discussion with him is like being hit on the head by an encyclopedia. He is the kindest man imaginable, always willing to answer questions, always on the lookout for new ideas, for new sources of historical materials, and for new earthquakes. He has lost none of his enthusiasm for science, and his sense of humor is just as sharp as it was four decades ago. It is with the greatest pleasure and with the deepest honor that I have worked with him on earthquakes in Afghanistan, Baluchistan, India, and the Himalaya in the past few years.

It is thus with a loud bravo that I applaud the SSA for identifying Nick as one of the great minds of engineering seismology, a mind that has quantified three millennia of ancient earthquakes for our future study, and one eminently deserving the society's prestigious Harry Reid Medal.

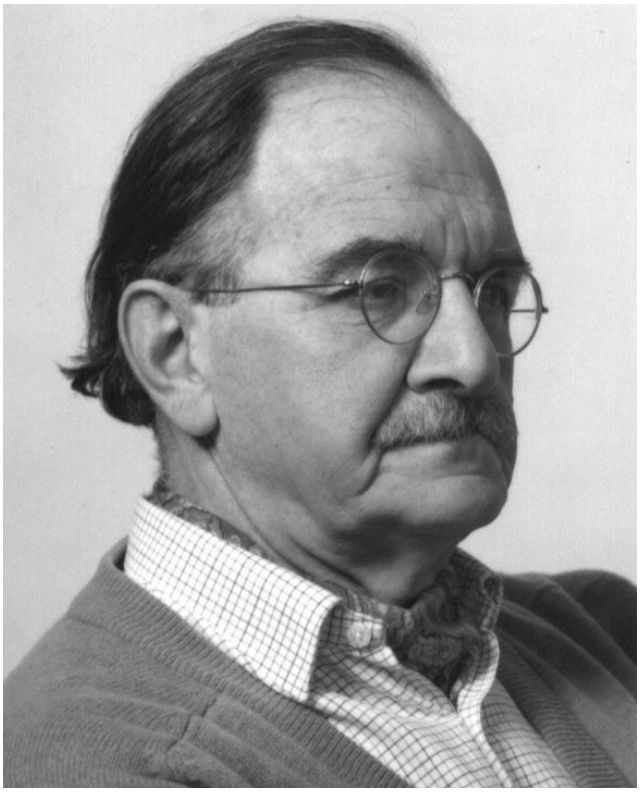
Roger Bilham
19 April 2006

Harry Fielding Reid Medal Acceptance

It is a great privilege to become a Medallist of the Seismological Society of America, and in presenting me with this award the Society have done me a great honour for which I would like to express my thanks and deep appreciation.

The best way to deal with an unexpected gift such as this is to pass it on by sharing it. Therefore, I would like to dedicate this award, which the Society have so encouragingly given me, to my early mentors, from whom I have learnt much of what I know of engineering seismology.

I have been privileged to work over many years with many fellows of the Society and I would like to acknowledge here the part that they have played in my own interdisciplinary endeavours.



▲ Nicholas N. Ambraseys

For many years I have derived a great deal of pleasure in my fieldwork and interest in teaching. To anyone who is really concerned with Engineering Seismology it is becoming increasingly apparent that the site of a damaging earthquake is a full-scale laboratory from which significant discoveries may be made, by seismologists, geologists, engineers, sociologists, or economists, not to mention politicians.

As our knowledge of the complexity of earthquakes has increased, we have become more and more aware of the limitations which nature has imposed in our capacity to predict their effects, on purely theoretical bases. It is field observations and measurements that allow the interaction of ideas and the testing of theories between members of a field party and help the young scientist to chose his line of research on realistic grounds and with enthusiasm. I feel that today perhaps too much effort has been diverted to computing and that field observations are now called for.

One may ask why despite the scientific and technological achievements of recent years, earthquake losses are still increasing steadily with time. Obviously this is partly due to the growth of population, urbanisation, and industrial development, not only in developing but also in developed countries, and in particular due to the fact that scientific progress and technical knowledge is not reflected in practice. Where economic and political interest is involved, lessons learned from disastrous earthquakes are not learnt for long.

It is too often the situation that earthquake resistant design is carried out by professionals who have little direct experience or knowledge of earthquakes. This situation, which might be called the "handbook" approach, has proved to be rather unsatisfactory. It is not sufficient for the earthquake engineer to acquire information from textbooks or codes of practice and use that information for design purposes without understanding the basic principles on which the information has been obtained and what it really means. Rather, it is necessary for the engineer to develop an intimate knowledge of all aspects of the real problem of finding alternative, economic solutions to problems in earthquake areas, and above all, developing an understanding of the risk involved, taking into account the vulnerability of the structure he designs and making the client aware of it.

I am delighted and honoured that the Society should have chosen to interest itself in my work, joining a company of so many distinguished earth scientists who have been awarded this honour since its creation. The broadmindedness of the Society is apparent in that it can do this to one not brought up as a seismologist.

I should like to take this opportunity of saying again how much I appreciate the honour that the Society has conferred on me. I will accept with gratitude this medal.

N. N. Ambraseys
15 March 2006