

In Memory of Fluid Inclusion Research Pioneers E. Roedder, N. P.

Ermakov, H. C. Sorby and Aly Raichan Beruny

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As we know, every scientific breakthrough could not be achieved without the groundwork laid by forefathers of science, so it is a great virtue for scientists and researchers to value the work done by those pioneers. In view of this spirit and based on the proposal from APIFIS, the XIII All-Russian Conference on Thermobarogeochemistry in conjunction with the IV APIFIS Symposium will be held in memory of Abu Aly Rahan Beruny, H. C. Sorby, N. P. Ermakov and E. Roedder. It's suitable for us to commemorate them at this combined conference, for their immortal contributions will go down to history and their achievements will continue guide us to conduct further research.

Among contemporary fluid inclusion researchers, E. Roedder (Ed) and N. P. Ermakov have made the most significant contributions to this field. They were modest, prudent and used to pay great attention to the growth of young researchers. They were great inclusion scientists since H. C. Sorby and they deserve the honor of being the fathers of inclusion kingdom.

We believe the year of 2008 will be a year of great significance to all the fluid inclusion researchers, for it is the 89th anniversary of the birth of Ed, the 95th anniversary of the birth of N. P. Ermakov, the 150th anniversary of the classic proposal of H. C. Sorby, and the 1025th anniversary of the birth of Aby Ali Raichan Beruny.

Great scientist Aby Ali Raichan Beruny (973-1048), the forefather of the fluid inclusion research (FIR), was the first scientist who gave description of gas-liquid inclusions in his manuscript book about gems. He thought that gems were formed from liquid solutions. He grounded his hypothesis on liquid inclusions in gems and he named these inclusions "juices of earth". He determined the main role of these inclusions as witness of formation minerals from liquid solutions from wombs of earth (E. Roedder, 1984 ; V. S. Polikovskiy, 1998).

Since Aby Ali Raihan Beruny made a start on inclusion research, it has been about 1000 years. It is in the year of 1858, that H.C. Sorby, Farther of Inclusion Research, founded the theoretical foundation. In the past 150 years, his theory remained the focus of fluid inclusion researchers and many people have been working to prove or disprove it. And this theory has undergone all these stages—incipience, research, suspicion, negation, re-research, re-affirmation to major development.

Ed is a great inclusion scientist of the 20th century. His achievements and contributions have been reported in details in some scientific books and periodicals. The following materials are from APIFIS NEWSLETTER 1998 (He Zhili, V. G. Moiseyenko & F. P. Mel'nikov; Acad. E. Roedder's Major Contributions to Science— Celebration of the 80th Birthday of Acad. E. Roedder).

"He is smart since very young. He has noble ideal, great goal, unconquerable will-power, unchangeable determination, proper scientific method, and willingness to work with someone who holds a different academic opinion. All those merits, along with his experience of several decades of hard work, result in his numerous achievements and his students all over the world.

In the year of 1993 and 1998, he was awarded respectively the Sorby Medal and Ermakov Medal. He has also been awarded many other honors, including the highest award by German Mineralogical Society (1985), Mineralogical Society of America (MSA, USA, 1986) and Soc. Economic Geologists (1988). In addition, NASA (1973), US Dept. Interior (1978), Czech Geol. Survey (1991) also awarded him medals respectively. Ed got his Ph.D. from Columbia University in 1950. In 1976, his alma mater, Lehigh university awarded him Dsc (ho.). In 1960, Ed and Ermakov and others established the Commission on Ore-Forming Fluids in Inclusions

(COEFI), and he had been the chairman for many years. In 1988, he was selected to work with National Academy of Sciences (USA). He was the Honorary President of APIFIS and also the American Representative in APIFIS (1994-1996). Ed loves mineral all along. His published papers amount to 327, of which 281 papers deal directly with issues of fluid inclusion. And these fluid inclusion papers mainly discuss the problems of ore deposits. He is a knowledgeable and prolific scholar. He has served as President of the MSA, as President of the Geochemical Society and as President of the Volcanology, Geochemistry and Petrology Section of the Am. Geophys. Union. As a member of the Editorial Committee, he has also taken part in the edition and publication of some important journals, such as *Economic Geology*, the *Bulletin of the Geological Society of America* etc. The COEFI (present name is Fluid Inclusion Research-FIR) was founded by Ed in 1968 with the help of his friends H. Belkin and A. Kozlowski. Ed was the editor of this magazine and this magazine is published annually. In each issue, all the inclusion research fruits were collected from all over the world. In each issue about 1000 (or more than 1000) items (for example, 1501 abstracts, citations of annotated citations in 1996), sometimes including the whole paper of particularly important documents, were published. Ed is also an active critic. Many papers of his colleagues were evaluated and corrected by him. Although he has retired due to his age, he is still taking part in many important academic activities and interminably doing his work. In the years of 1992, 1994, 1996, he was invited to China, where he had served as Honorary President of some international conferences, helped establishing the APIFIS and guided its academic activities.

As mentioned by other colleagues, his another great contribution is the masterpiece of *Fluid Inclusions* (644 pages, 2001 references, 1984), which is the most important book on FIR since H. C. Sorby. In this masterpiece, we can see the achievements and tendency of the development of FIR. In 1965, he also edited the English version of the articles (1950) written by N. P. Ermakov and many other scientists. Admittedly, Ed is a scholar who excels in three aspects, teaching, researching and producing.

The research of Ed concerns every aspect of inclusion, in which he has made great achievements. His accomplishments in other fields are also striking. For example, his experimental work on liquid immiscibility has proven to be unexpectedly important to the interpretation of both lunar and terrestrial iron-rich igneous rocks (Philip M. Bethke, 1988). He also engaged in the safety of nuclear waste repositories, in which fluid inclusion has played an important role (Ed, 1984). He and H. Belkin have made great contribution in this aspect.”

N. P. Ermakov is another great fluid inclusion scientist. We took great pleasure to read his some interesting papers and works. In the book *Inclusion Mineralogy* written by He Zhili (1982), some achievements of N. P. Ermakov and his colleagues have been quoted. The 1st author of this paper was invited to visit USSR many times and had chance to visit his office and laboratory before his death.

N. P. Ermakov was Dr. of geology and mineralogy sciences, winner of the State Prize, Prof. of Moscow State University, President of COEFI and a founder of thermobarogeochemistry. His main achievements were reported by some researchers including F. P. Mel'nikov (former USSR), E. Roedder (USA) V. S. Polickovsky (Uzbekistan), He Zhili (China) and others. N. P. Ermakov studied at the Central Asian State Lincey, Moscow Geology-Prospecting Institute and worked in Tashkent (1931-1936). The young geologist N. P. Ermakov discovered Agata fluorite deposit in 1932. In 1946 N. P. Ermakov began to work at Lvov State University. He organized the 1st laboratory of mineral forming solutions and called many young scientists together in his lab (Y. A. Dolgov, V. A. Kalyuzhny, A. V. Piznur etc.). His fundamental monograph *Investigation of Mineral Formation Solutions* published in 1950. Under the direction of E. Roedder, this famous book was translated from Russian into English in 1965. Before this book, of all the USSR books, only *Pegmatite* written by Acad. A. E. Fersman had been translated from Russian into English.

Some important scientific research centers on fluid inclusion (thermobarogeochemistry laboratories) were established in former USSR under the direction and help of N. P. Ermakov and his colleagues. These centers were located at the following places: Lvov, Moscow,

Leningrad, Kiev Minsk, Novosibirsk, Ulan-Ude, Blagoveshchensk, Vladivostok, Petropavlovsk-Kamchatsky, Magadam, Yakutsk, Krasnoyarsky, Tashkent, Dushanbe , Alma-Ata, etc. There were a lot of FIR scientists in these laboratories. And some of leading researchers worked in these units mentioned above. Large scientific researches were conducted by F. P. Mel'nikov and D. N. Khitarov (V.S. Polickovsky, 1998).

In 1960 N. P. Ermakov was elected Chairman of the Commission on Ore Forming Fluid Inclusions (COFFI) and E. Roedder as Vice Chairman.

The following are some main achievements and merits of N. P. Ermakov.

1. He had sharp eyes, very clear thought and was quick in scientific activities. Especially, he was good at grasping the advances and trends in fluid inclusion research in USSR and all over the world. His scientific activities are very fruitful.

2. Some papers and works of N. P. Ermakov are the important acquisition enriching the treasure-house of fluid inclusion research. For example, the research of ore-forming solution, the classification of mineral inclusions and its significance, the discovery and research of some anomalous gas-liquid inclusion in minerals, and the application of inclusion mineralogy in searching for new ore deposits and blind ore bodies, all these are all very important and very useful for us and the later generations.

3. The simple equipment, some of which were designed by him used to be applied in his research work. They helped him to get some very important results and achievements. For example, the Ermakov heating stage is one of the simple equipment.

4. He was good at absorbing the materials of the scientific papers and works, and quoting copiously from many sources. N. P. Ermakov was a creative great scientist. Some of his students including foreign students have become the leading inclusion mineralogists in CIS and other countries.

5. He used to pay great attention to the three-in-one combination--scientific research, teaching and production. As mentioned above, some of his students have excelled in their respective field. Up to now, most of his works and papers about fluid inclusion as tools in mineral prospecting and exploration have been published in Russian. He set a good example for us; many other researchers follow the suit and prove this practice is very useful and important.

6. He was also a man of ability in organizing scientific research, developing international academic exchange and cooperation. Some important scientific research centers on fluid inclusion have been established in former USSR under the direction and help of N. P. Ermakov and his colleagues. In 1960, according to the proposal by Ed, N. P. Ermakov, etc., COFFI, as an important committee in IAGOD, was established. The organization is useful for promoting the development of inclusion research and its application to the geosciences, and it is important for academic exchange and cooperation among the geologists and fluid inclusion researchers all over the world. Although Soviet geologists started to study fluid inclusion since 1941, the former USSR was one of the most important counties for fluid inclusion research at the beginning of 1950s, which was surely attributed to the direction of N. P. Ermakov.

We took great pleasure to read some interesting papers and works of N. P. Ermakov. In the book *Inclusion Mineralogy* written by He Zhili (1982), some achievements of N. P. Ermakov and his colleagues including F. P. Mel'nikov, V. A. Kalyuzhny, Y. A. Dolgov, etc. have been quoted. The 1st author of this paper was invited to visit former USSR many times and had many chances to visit his office and laboratory before his death. He Zhili was quite impressed by his personality and academic achievements.

Unfortunately, one year before this meeting, the leading scientist F. P. Mel'nikov, who was one of main founders of the APIFIS, Ermakov Golden Medal Winner, COFFI ex-Vice Chairman, APIFIS ex- General Secretary, APIFIS Honorary General Secretary, Prof. of Moscow University also passed away. He and His achievements will live in our memory for ever.

The great scientists and leading fluid inclusion researchers are good teachers and helpful friends of us. They exerted unremitting efforts throughout their life and made very important contribution in promoting the development of FIR and the mutual understanding, friendship,

scientific exchange and cooperation between the fluid inclusion scientists and geologists all over the world.

The memory of the pioneers mentioned above will live for ever in the hearts of all the fluid inclusion researchers. The development of FIR will be continued, because the later generations including us would surely follow in their footsteps and make more significant contribution to this field.

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