

Luciano Ungaretti

Luciano Ungaretti passed away on February 16, 2001. He was diagnosed with cancer in late Spring 2000, and he decided to fight this battle with the same positive and altruistic attitude he had maintained in all aspects of his life. Apart from the period he had to stay in hospital, he continued to come into the Department, to teach his classes, to give stimulating suggestions to young scientists and to discuss with his colleagues the situation and perspectives of their research and of the mineralogical community. He will be remembered by all of us also for this last lesson in life.

Luciano was born in Cherso in 1942. During childhood, his family moved to various regions in Italy; these experiences left him with many nice stories to tell, and probably increased his curiosity and his ability to begin innovative projects. After this early period he settled in Pavia, where he attended the prestigious Collegio Ghislieri and graduated in Chemistry in 1965. His thesis advisor was professor Fiorenzo Mazzi, a “guru” of Italian and European mineralogy. His subsequent academic career took place in Pavia, where Luciano became a full Professor in Mineralogy in 1980. After that he held several academic offices; in particular, he was the Director of the CNR-Centro di Studio per la Cristallografia e la Cristallografia (1990-1993), the Dean of the Faculty of Sciences (1997-2000), and an esteemed member of the Senato Accademico. His research work earned him the Hawley Medal of the Mineralogical Association of Canada (1994) and the Fellowship of the Mineralogical Society of America (1995), as well as the dedication of the first oxy end-member of the amphibole group. His expertise and ability to provide stimulating suggestions were some of the reasons he became one of the Chief Editors of the European Journal of Mineralogy (1995-2000).

Since the very beginning of his career, Luciano Ungaretti played a leading role in the Italian and international community. His research interests were mostly centred on crystal-chemical studies, but the “substrates” of his work ranged from minerals to material science, to organic and inorganic molecular compounds, and even to proteins. In the period devoted to pioneer research in protein crystallography, although limited in time (1974-1980), his enthusiasm and creativity were essential for the founding and development of a well-organised group in Pavia. However, Luciano’s most important scientific contributions concern the crystal chemistry of rock-forming minerals.

Most of Luciano’s work was based on the innovative idea that single-crystal X-ray refinement could be used as a highly sophisticated analytical method, which could allow quantitative measurements of the total content and site distribution of all the chemical elements, as well as their oxidation state, in complex minerals. In his opinion, one of the most exciting goals of mineralogical crystal-chemistry was to provide sound and detailed models of mineral behaviour as a function of P , T , and X ; they should be at the basis of petrogenetic studies and thermodynamic modelling. He thus devoted an incredible amount of time toward improving procedures for data collection and treatment as well as for structure refinement, and constructing complex statistical models allowing accurate calculation of the site populations from the refinement results. Systematic crystal-chemical studies of rock-forming minerals (in particular amphiboles, pyroxenes, garnets, staurolites, epidotes) greatly benefited from this innovative approach. All those who visited the CNR-CSCC remember the exciting time spent with him at the diffractometer trying to optimise the parameters and afterwards comparing huge computer outputs with the results of the several attempts. All those who continuously worked with him remember his incredible ability to look beyond the results he had just achieved, and to find a new exciting challenge.

This incurable curiosity and perfectionism sometimes drove students and young researchers to desperation. They were never allowed to write a paper on their work until all the details were understood. This is



also one of the reasons why Luciano's bibliography "only" lists eighty papers, some of which, however, contain structure modelling based on tens or even hundreds of refined samples.

Luciano also devoted much time to teaching and tutoring, as well as improving the educational facilities at the University of Pavia. His students will remember his fascinating lessons and his ability to introduce the development of civilisation into his mineralogy lectures. Many students will benefit from the new special courses he helped to design with the idea of providing scientific information to students of non-scientific faculties and *vice versa*, and of providing post-graduate training for new professional opportunities.

Luciano served for five years as Chief Editor of the European Journal of Mineralogy. Being an Editor is always a difficult and time-consuming task, in which one must combine scientific rigour with impartiality and with a maieutic attitude towards younger and less well-equipped researchers. I think that all the authors who had their manuscripts handled by Luciano appreciated his continuous efforts to improve the quality of the results and to find out together with them all the possible implications. The mineralogical community in Europe and abroad will remember him fondly for many years to come.

Roberta Oberti

Selected bibliography*

- Cannillo, E., Rossi, G., Ungaretti, L. (1973): The crystal structure of elpidite. *Am. Mineral.*, **58**, 106-109.
- Dal Negro, A., Kumbasar, I., Ungaretti, L. (1973): The crystal structure of teruggite. *Am. Mineral.*, **58**, 1034-1043.
- Rossi, G., Tazzoli, V., Ungaretti, L. (1974): The crystal structure of ussingite. *Am. Mineral.*, **59**, 335-340.
- Mazzi, F., Ungaretti, L., Dal Negro, A., Petersen, O.V., Ronsbo, J.G. (1979): The crystal structure of semenovite. *Am. Mineral.*, **74**, 202-210.
- Ungaretti, L. (1981): Recent developments in X-ray single crystal diffractometry applied to the crystal-chemical study of amphiboles. *God. Jugosl. Centr. Kristalogr.*, **15**, 29-65
- Ungaretti, L., Rossi, G., Smith, D.C. (1981): Crystal chemistry by X-ray structure refinement and electron microprobe analysis of a series of sodic-calcic to alkali amphiboles from the Nybø eclogite pod, Norway. *Bull. Soc. fr. Minéral. Cristallogr.*, **104**, 400-412.
- Rossi, G., Smith, D.C., Ungaretti, L., Domeneghetti, M.C. (1983): Crystal-chemistry and cation ordering in the system diopside-jadeite: a detailed study by crystal structure refinement. *Contrib. Mineral. Petrol.*, **83**, 247-258.
- Ungaretti, L., Lombardo, B., Domeneghetti, M.C., Rossi, G. (1983): Crystal-chemical evolution of amphiboles from eclogitised rocks of the Sesia-Lanzo Zone, Italian Western Alps. *Bull. Minéral.*, **106**, 645-672.
- Hawthorne, F.C., Ungaretti, L., Oberti, R., Caucia, F., Callegari, A. (1993): The crystal chemistry of staurolite. I. Crystal structure and site populations. *Can. Mineral.*, **31**, 551-582.
- Hawthorne, F.C., Ungaretti, L., Oberti, R., Caucia, F., Callegari, A. (1993): The crystal chemistry of staurolite. II. Order-disorder and the monoclinic-orthorhombic phase transition. *Can. Mineral.*, **31**, 583-595.
- Hawthorne, F.C., Ungaretti, L., Oberti, R., Caucia, F., Callegari, A. (1993): The crystal chemistry of staurolite. III. Local order and chemical composition. *Can. Mineral.*, **31**, 597-616.
- Hawthorne, F.C., Ungaretti, L., Oberti, R., Bottazzi, P., Czamanske, G.K. (1993): Li: an important component in igneous alkali amphiboles. *Am. Mineral.*, **78**, 733-745.
- Mazzi, F. & Ungaretti, L. (1994): The crystal structure of vitusite from Ilimaussaq (South Greenland): Na₃REE(PO₄)₂. *Neues Jb. Mineral. Mh H2*, 49-66.
- Hawthorne, F.C., Ungaretti, L., Oberti, R., Cannillo, E., Smelik, E.A. (1994): The mechanism of Li incorporation in amphiboles. *Am. Mineral.*, **79**, 443-451.
- Oberti, R., Hawthorne, F.C., Ungaretti, L., Cannillo, E. (1995): Al^{VI} disorder in amphiboles from mantle peridotites. *Can. Mineral.*, **33**, 867-878.
- Oberti, R., Ungaretti, L., Cannillo, E., Hawthorne, F.C., Memmi, I. (1995): Temperature-dependent Al order-disorder in the tetrahedral double-chain of C₂/m amphiboles. *Eur. J. Mineral.*, **7**, 1049-1063.
- Merli, M., Callegari, A., Cannillo, E., Caucia, F., Leona, M., Oberti, R., Ungaretti, L. (1995): Crystal-chemical complexity in natural garnets: structural constraints on chemical variability. *Eur. J. Mineral.*, **7**, 1239-1249.
- Ungaretti, L., Leona, M., Merli, M., Oberti, R. (1995): Non-ideal solid solution in garnet: crystal structure evidence and modelling. *Eur. J. Mineral.*, **7**, 1299-1312.
- Merli, M., Ungaretti, L., Oberti, R. (2000): Leverage analysis and structure refinement of minerals. *Am. Mineral.*, **85**, 532-542.
- Callegari, A., Caucia, F., Mazzi, F., Oberti, R., Ottolini, L., Ungaretti, L. (2000): The crystal structure of peprossiite-(Ce), an anhydrous REE and Al mica-like borate with square pyramidal coordination for Al. *Am. Mineral.*, **85**, 586-593.

* The complete publication list is available from the E.J.M. Editorial Office - Paris.