



# Ivano Bertini

## 1940–2012

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Ivano Bertini left us on 7 July after a short illness. The chemical, biological and biomedical communities—indeed, society at large—have lost a unique and magnetic personality that will not be easily forgotten by those who have known him personally.

Although it is not unusual to hear that someone dedicated his life to science, this statement takes a special meaning for Ivano. He was fully active and a leader until, literally, the very last days of his life. Over almost 50 years, his drive and vision have allowed him and, even more importantly, many others to make enormous contributions to the advancement of science. We are proud and honored of our 38- (C.L.) and 28- (L.B.) year collaborations and friendships with him.

One could not avoid knowing Ivano: he was 'loud' in all senses. In a room full of people, his booming voice would always tell if he was around. He was also tall and large and would speak loudly to the heart of any new acquaintance, making himself unforgettable. He also had a loud love for science. In his office, he had a banner that said, "La scienza è come l'amore: non puoi non pensarci sempre" (Science is like love: you can't help thinking about it all the time).

A chemist by training, Ivano was initially focused on coordination chemistry, working at the University of Florence with his mentor Luigi Sacconi. He soon came to realize, in part through a life-long scientific and personal relationship with Harry Gray, the relevance of the study of the role of metal ions in biological systems. Additionally, he foresaw the strategic role that NMR would have in analyzing structure-function relationships of metalloproteins, including paramagnetic ones. In this field, he made unique contributions both in theory and in innovative applications: he was among the first to apply NMR to paramagnetic metalloenzymes to characterize active sites and was the first to solve a solution structure of a paramagnetic protein. His innovative methodological advances led to approaches that are now routinely used in the calculation of solution structures by NMR and have contributed to studies of other challenging systems such as those

involving intrinsically disordered, fibrillar or sedimented proteins.

The story of the first solution structure of a paramagnetic protein is a typical example of Ivano's response to scientific challenges. In the early nineties, about ten years after the first protein NMR structure, it was implicit that paramagnetic relaxation prevented NMR analysis of paramagnetic proteins. On a midsummer Sunday at Ivano's country house, however, we were reading a recent review article by a well-known NMR spectroscopist that explicitly stated it would never be possible to solve NMR structures of paramagnetic proteins. Ivano said, "Do you believe it?" We said, "No." He then said, "This is a project that will need the whole lab." The next day, we were all at work; the paper was published 14 months later. With that work, a taboo had been broken, and many structures of paramagnetic proteins have been solved since then.

Ivano always pushed research toward new goals and new challenges. He exploited omics approaches to study metalloproteomes (the complete sets of proteins related to each metal ion), developing innovative bioinformatics tools to screen genomes for metal-binding proteins. By applying structural biology to systems biology, he showed that integrating techniques could allow functional processes to be described in a cellular context. He made major contributions to understanding copper transport and was able to describe this process, as well as mechanisms of protein import and protein folding, with atomic detail. His vision of the relevance and impact of omics approaches led him to start a new adventure in the field of metabolomics, using statistical analyses of biological fluid NMR profiles to discover that each individual has a distinct metabolic fingerprint. The profound implications of this finding are becoming increasingly apparent.

Ivano's incredible energy and drive made him a key player in the international

scientific scene. His vision and determination led him to create the NMR Center of the University of Florence (CERM) and the interuniversity paramagnetic NMR consortium, CIRMMP. He made CERM/CIRMMP a leading European NMR facility and a core center of the European Integrated Structural Biology Infrastructure (INSTRUCT), providing access to the facility and its expertise for scientists around the world. Indeed, he always promoted coordination, interactions and exchanges among scientists. In 1983, together with Harry Gray, Bo Malmstrom and Helmut Sigel, he started the International Conferences on Bioinorganic Chemistry (ICBIC), a key move for the growth of bioinorganic chemistry. He further promoted the integration of previously dispersed European workshops in bioinorganic chemistry to yield the EUROBIC series, with all of these activities leading to the foundation of the Society of Biological Inorganic Chemistry (SBIC), with its own journal (Journal of Biological Inorganic Chemistry), of which Ivano was the first editor in chief. Likewise, the magnetic resonance community has also benefited enormously from his work, forward thinking and ability to coordinate different and diverse approaches.

To those who asked him why he would put so much effort into organizing things that would benefit the whole community, suggesting that he should be a little more selfish with his time, he used to answer that he did indulge in selfishness by bringing many top scientists to Florence to make personal acquaintances and lower the barriers to scientific interactions—over a glass of Chianti wine!

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