The purpose of this lecture is to cover a much broader scope than conventional inorganic and solid state fluorine chemistry, reaching important disciplines in which fluorine and fluoride compounds have a decisive impact, such as physics, environmental sciences, biology, health, earth sciences, materials sciences, new technologies and, why not history of sciences, archaeology, and cosmochemistry.

The general properties of fluorine will be presented, pointing out the dual character of this element: on one hand so reactive that F2 gas could not be isolated for centuries, nor found on the Earth surface until these last few years; and on the other hand yielding compounds so stable that some of them, i.e. the CFC’s and HFC’s, stay unmodified up to the stratosphere and also contribute to the greenhouse effect. This great stability has allowed fluorinated polymers to be used for instance in vascular or retinal surgeries, and as fluorobiomaterials in cariostatic dental composites, in cosmetics, or in hospitals, laboratories and kitchen wares. The fluorinated products are also of primary importance in most fields of sciences and new technologies: photonics, electronics, energy storage, nuclear energy, dye-sensitized (or perovskite-based) solar cells etc.

From the last part of the twentieth century fluorine chemistry has experienced a renaissance, because of the outstanding properties attached to this element. Among the important results, it can be quoted: surface functionalization of materials, compounds for new or alternative energies, up-conversion and micro-electronics, new drugs, surfactants, fire emulsions, new propulsion- or anti-fire gases less harmful for our environment, protection of our cultural heritage, archeometrics, etc. Numerous fluorinated molecules have appeared on the market with beneficial aspects for agriculture, pharmacy, medicine and biomedical sciences, with more than 600,000 compounds containing at least one fluorine atom. These drugs have anti-cancer, anti-inflammatory, analgesic or antidepressant properties, anti-malaria, early detection of Alzheimer’s disease, but also in medical imaging,
[magnetic resonance imaging and 18F positron emission tomography (TEP) scan, allowing early detection of cancer metastasis], dental restoratives bioceramics, cardio-vascular or ophthalmologic surgery, contrast and respiratory gas transport agents, blood substitutes, etc.

Although the benefits of fluorine compounds for our society are evident in many fields, the drawbacks caused to our environment by some of these products should not be underestimated, such as the phasing out of PFOAs, as biologically persistent products. However, this dual aspect should promote among groups dealing with fluorine and fluoride products a great challenge for finding solutions to overcome all these problems.

References
“Progress in Fluorine Science”, A. Tressaud Series Editor, Elsevier, USA