This project looks at the subject of molecular structure in chemistry and its quantum mechanical basis. The project brought together philosophers and scientists who discussed these ideas at international workshops. In doing so the project has raised awareness of philosophy of science among chemists and of foundational issues in chemistry among philosophers of science.
Molecular structure is central to explanation across chemistry, yet has been largely ignored by philosophers. The aim of the project was to investigate structure in chemistry and its quantum-mechanical basis. This project brought together philosophers and scientists, through workshops in Philadelphia and Durham, to discuss this key theoretical idea.

The project addressed the following five key areas:

1. the different notions of structure employed in explanations in different parts of chemistry
2. the mathematical and explanatory relationships between these different notions of structure;
3. how weak bonds and short-lived structures challenge the concepts of bond and structure;
4. the grounding of structure in quantum mechanics.

The project has opened up a philosophical discussion of structure and its role in chemical explanation, and whether the chemical bond should be eliminated from chemical theory, consigned to a merely heuristic role, or accepted as real on the available chemical evidence. The project has also raised awareness of philosophy of science among chemists and has raised awareness of foundational issues in chemistry among philosophers of science.

The project has also formed an international research network on the foundations of structure, involving philosophers, chemists and physicists who are actively engaged in research into molecular structure. The philosophers and scientists worked together, each using their distinct disciplinary expertise to critically examine and refine the others’ claims and arguments.

The philosophers who presented at the project workshops were able to test and develop their understanding of scientific conceptions of structure and its role in science, informing ongoing philosophical debates. In collaboration with philosophers involved in the project the project’s Principal Investigator, Dr Robin Hendry, is planning an edited collection on structure, bringing together foundational perspectives from philosophy, chemistry and physics and is also pursuing a major collaborative project on emergence with physicists involved in the project.

The main outputs of the project are two journal articles: one setting out the different notions of structure in chemistry, and arguing for pluralism about structure, and another examining the difficulties in defining a well-known structural notion: the hydrogen bond.

For further information please see the project website: www.dur.ac.uk/structure.chemistry