Up until now, I have been researching commutative ring theory, focusing on combinatorial aspects. Characterized the Buchsbaum property of Stanley-Reisner rings and defined the notion of doubly Buchsbaum property. Stanley-Reisner ring is also defined from an ordered set (poset for short), so I considered posets in that relationship and interested in the relationship between posets and commutative ring theory. Therefore, I shifted my research focus to algebra with straightening law (ASL), especially rings defined by the vanishing of given minors of given matrices (determinantal rings). I have obtained several results regarding ASL structure.

Around that time, professor Sakata of Kyushu University (who has now passed away) invited me to work with him and professor Sumi of Kyushu University. We began joint research on so called tensors, high-dimensional version of matrices, especially research related to their ranks. In this, the above knowledge of determinant rings plays an important role, and the relationship between commutative ring theory and tensor theory has also been revealed.

On the other hand, I also investigated Hibi rings, which are ASLs related to other fields of mathematics, and succeeded in describing the generators of the canonical module by the combinatorial structure of the poset that defines the Hibi ring, and characterized the level property and anticanonical level property of the Hibi ring. Furthermore, I clarified that the generators are arranged in a way that forms a toric face ring.

A Hibi ring is an Ehrhart ring of a convex polytope called an order polytope defined by Stanley. In the paper, Stanley discussed the similarity between two convex polytopes called order polytopes and chain polytopes, which are defined from the same poset. I have therefore investigated the similarities between the properties of Hibi rings, i.e., Ehrhart rings of order polytopes, and those of chain polytopes, and have achieved some results. In particular, I have shown that if the Ehrhart ring of the chain polytope of a poset is level (resp. anticanonical level), then so is the Ehrhart ring of the order polytope, but the converse is not true. In addition, in collaboration with Janet Page, we have succeeded in describing the non-Gorenstein locus of these rings.