

Andrew Smith Section 10

My research focuses on gel-based glues produced by animals. Many molluscs (snails and slugs) can form strong attachments using dilute gels. Limpets, for example, can often glue themselves onto rocks so firmly that one needs tools to pry them off. This is particularly impressive because they do it underwater; they can attach to wet, slippery surfaces that confound artificial adhesives. Furthermore, the molluscan adhesive gels are often 97% water, and appear to be modifications of the normal lubricating slime the animals secrete. We are interested in how animals can convert dilute, lubricating gels into strong adhesives. We have found specific proteins that are correlated with the change from a lubricating gel to an adhesive gel. In addition, we have shown that these glue proteins stiffen gels and improve their ability to stick to surfaces. Thus, these are novel and interesting proteins. Now our primary focus is to determine how the glue proteins cause these effects. We are also interested in differences between glue proteins from different species. Understanding how these adhesives work could lead to the development of new glues. In particular, such glues are very promising as potential medical adhesives.

We use four major approaches to study these glues:

- Using biochemical tools to characterize the structure of the glue proteins and the other components of these gels
- Measuring the mechanical properties of gels made with glue proteins and different polymers
- Using biochemical and mechanical tests under different conditions to determine how the glue proteins cause mechanical changes
- Studying other aspects of the glues, such as the attachment strength under different conditions and the mechanism of detachment.