Of squeakers and the ocean of maths

Metaphorically speaking, students at ETH are like squeakers hungrily raising their beaks, whereas ETH professors are white-tailed eagles circling the skies, regularly bringing back to their nests large shiny fishes from the ocean of maths. Now there might be up to 600 students sitting in that lecture and expecting to be taught mathematics – after all they obediently attend up to 35 hours of compulsory classes on their weekly schedule. The professor has also spent quite some time on preparing and presenting a great lecture (and sometimes also a manuscript) covering a large and beautiful piece of mathematics, and now wants to get back to his internationally renowned research. But still very little squeakers venture to bite a bit off the fish and even less are able to digest it. This gap in the teaching process is bridged by a system of example classes and office hours, mostly under the sole responsibility of teaching assistants. These herd the squeakers in classes of at most 40, cut the most important concept out of the fish, mix it with a smooth mesh of examples and problems, and feed it to the squeakers until they manage to digest it – solve the problems.

Most squeakers are ratites who want to grow big and strong so they can digest all kinds of prey that they catch in their engineering subjects – solve the mathematical problems that they come across. These need loving care, so they do not become afraid of the fish or the prey, and they need to learn about the general anatomy of prey, so they can dissect it properly instead of just pecking at it. They do not need to see into the depth of the ocean of math, although they should get a good idea of it from the fish and the teaching assistants leading them to the shores.

The main task of the mathematics students, however, is to learn to fly, so they have to leave their comfortable nests where they can just sit and digest. Sometimes they have to be kicked out of the nest and either take to the sky – think for themselves – or crash when they are told that their arguments are still mathematically incorrect. Most importantly, the fledglings need to be able to determine wether they are still on the ground – not understanding – or have taken off. From that point on the little birds can follow the eagles to the ocean of maths and the teaching assistants are only needed to make sure that they do not land on rocks of misunderstanding. Now out on this large ocean of mathematics and its shores of application it is not so important that the little birds see every corner and wave on it – they need to get an overview and know some parts properly, but most importantly learn to fly long and high, so they can discover other parts for themselves. They also need to know a little about the shores, so they can guide lost sailors that they may meet. Moreover, most little birds will go back ashore, where the knowledge of the oceans is not so important but flying is very useful.

Finally, some little birds want to become real birds of prey and catch new fishes. Doing research is hard to teach, after all even the eagles often miss a fish and then sit all dizzy and wet on a rock. But the birds with the better eyes can show the others the fish and make sure that they do not dive for fish that swim too deep in the ocean. The diving then is a result of a good flight and the right portion of courage, both of which can be adjusted by a good adviser flying along with the student – and not hesitating to get wet together.