>> Sally: I think this year's iGEM competition is the best ever.

The project we just heard about was amazing!

>> Dude: And that bacterial flotation device was totally cool!

It's the balloon-o-genesis module I've been looking for.

I want to try it with my Bacterial Balloon idea.

I know it'll work.

>> Sally: I thought you were done with Bacterial Balloons!

>> Dude: Sally, where's your curiosity?

We'll need to put the flotation-thing-a-ma-gjiggy together with the Gas-o-Matic module and this time put some feedback program at the promoters to make the devices stop...this is SO going to work.

>> Sally: We can try to build it when we get back to lab but some of it looks like very specialized DNA.

First, we'll need a feedback loop that works for Buddy.

Second, the flotation module is more than 6000 base pairs.

Didn't that team say that it works better if these two sections are removed?

Maybe we should directly synthesize the shorter flotation part with a Buddy feedback loop, then we can hook it up to the Gas-o-Matic module we already have in the lab.

>> Dude: Now you're talking!

But I think I forgot how to directly synthesize DNA...I mean we've done so many things in the lab and I remember a lot of them but...

>> Sally: Dude, we don't synthesize it.

We get a company to do that for us.

>> Dude: Whew.

So do I copy down this picture from the board and mail it to them?

>> Sally: You could but they wouldn't know what to do with it.

We'll need to send them the exact DNA sequence, and then they can string the Gs, As, Ts, and Cs together in the right order.

Every DNA synthesis company does it a little differently but the chemistry is pretty standard.

It involves protection and deprotection of a growing DNA chain with specialized bases called deoxynucleoside phosphoramidites.

>> Dude: Gesundheit!

Sorry. What's so special about them?

>> Sally: Only one base links to a DNA chain at a time until you deprotect the end, which then allows you to add the next base in your sequence.

>> Dude: That sounds like a pain.

>> Sally: No, think about it.

All you have to do is attach your first base, let's say a protected G, to some sort of polymer or bead, and then when you deprotect the G you can add a second base, how about an A?

Then when you deprotect that A, you can add a third base, let's put a T there.

>> Dude: Ha!

even I know that won't work.

What if that A doesn't hook up?

Then you've got G-T instead of G-A-T.

What good is that?

>> Sally: Dude, you're smart, but so are the chemists who worked on this.

There's one more step called "capping" so that any deprotected base that doesn't properly connect is shut down and can't be added to.

Those shorter pieces of DNA can be taken out of the mix at the very end.

>> Dude: But won't there be a lot of mistakes to get rid of?

Even if capping works half the time, you'll be getting rid of half your sequence, then half of that half...you'll have nothing left.

>> Sally: Luckily this construction process is more like 99% efficient.

But even so, you can't build something as long as this 6000 base pair flotation device.

Most companies build a bunch of shorter oligo nucleotides, maybe 60 base pairs long, and then use PCR to stitch them together.

>> Dude: and you trust them to do all this right?

>> Sally: They verify the final DNA by sequencing it before they send it to you.

Sometimes there are problems at one stage or another but DNA synthesis is getting faster and less expensive every year.

>> Dude: Sally this is great!

With your credit card and my ideas, we can write some DNA that's completely new.

Race you back to lab.

I want to get this DNA ordered today.