

Galaxy of granules – a hidden universe

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Let me start at the very beginning. Don't worry, it won't be too long. To tell you a bit about myself- I am a protein, one in the vast array that builds the living organisms. Yes, the very same thing that you consume as a shake after your workout at the gym. I won't tell you the whole of my story- but only a part of it, the part where there is a bit of adventure. It all begins in the middle of the sea, on a dark, scary night. "The night is dark and full of terrors", as some like to remind us often. We were sailing in a boat in the huge sea. Sometimes we floated around, sometimes we rowed- we travelled often this way. Life could be peaceful. Oh, said too soon! Dark clouds gathered over the horizon. There was a loud clap of thunder- a storm was approaching! I could identify it with my years of training at this sort of thing. Everything seemed to be going haywire. Many of the younger and inexperienced ones panicked, but not I. We knew the steps, aye, we did, the old, experienced ones. We started rowing vigorously to the closest island. All around us, we could see the other boats doing the same. On the islands, the emergency response team had already set up the tents for the camps. We all distributed ourselves to different campsites. I could see fear on every face. Of course, we are not cowards! We hide to protect our world, the only one we have known. If we die, our world will be left in a mess, perhaps even destroyed forever. Hence we scurry to safety. It is all for the greater good, you see! This is a difficult situation, but not one that hasn't occurred before, so we knew we would survive this. It started raining- the huge raindrops falling on our tents in the camp. And then, something out of the ordinary happened. Before the brave ones could venture out, there was lightening- bright blue and intense, the likes of which we had never seen before. The raindrops on the tents began to glow a bright fluorescent red, the whole galaxy bathed in a bright glow. Something was looking at us, focused and deep in thought. "Wow!" said some protein next to me. "Wow!" shrieked the something that was looking at us. "Wow! Look what I see here!" We knew at that moment, they existed- we call it our own "Wow! signal". They were humans, as are you. This was the day they saw our camps, where we live. We did not even have a name for our camps then. They named them "stress granules" since they were first observed under stress. That's one fancy name, I would say! Stress granules are the communities we proteins form to support each other in difficult and stressful situations. Before your fellow humans tell you more about us, I will tell you a part of it. As you already know, I am a protein. Our entire world is just a cell to you, a tiny cell, the fundamental unit of life. Our world contains a viscous water-like fluid- the "cytoplasm", or the sea we float in. Being seafarers, we travel by sea, through the cytoplasm. After we are born, we sail till we reach our destined workplace. This is a normal day scenario for us. When a stressful situation arises, our little world invests its energy in saving its existing citizens, that is, us. The stress can be heat, cold or starvation, among others. Stress granules are very small- only 100-200 nm, or one to two ten-thousandth of a millimetre! But they consist of hundreds of us proteins, which need to be saved. After all, we are the building blocks of cells and therefore life, and each of us has an important role to play in order to keep the cell functional. But it is not so simple and straightforward- even in this tiny, tiny world, hierarchy comes to play a role during difficult situations. The most important and the strongest of proteins settle down in the center of these camps, forming the core. Apart from the core, the granules contain an eclectic assembly of other proteins, which vary with the nature and duration of stress, forming an outer shell. Depending on the intensity of stress, these camps can get quite full, with proteins squeezed in shoulder to shoulder. In such a situation, we look for other protein communities in our world to exchange or

transfer some community members, to bail us out for the greater good- for survival of the cell. When the stress is gone, proteins sitting in the outer shell of the granules venture out first. Important proteins from the core then peek out later, only after the situation has been confirmed to be safe again. Then we all get back into our boats and resume our journey towards our destination. That's for a happy ending! This process sounds simple as I narrate it to you, but believe me, it is a very complex one. And a critical one too- scientists predict that stress granules might have a variety of roles to play in life-and-death decisions under several stressful conditions that the cell goes through. Understanding these processes is a difficult task, I know that. There are still thousands of mysteries in this galaxy of granules waiting to be unravelled, many important camps yet to be unveiled, many signature steps to be discovered. I could tell you so much more about this, but I have to get back to work now. Perhaps your fellow humans might be able to explain to you better, after they have unravelled more of our secrets, of course! Till then, good luck! We look forward to welcoming you in the galaxy of granules, with yet another story to narrate!