Eukaryon

Volume 4 Article 15

3-7-2008

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Distinguishing snRNPs ("snurps") from Smurfs

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Some may remember a famous line from the hit NBC sitcom "Seinfeld." A hapless George, about to go on vacation, is told that misfortune will befall him by a palm reader. "Lupus—is it lupus!" he exclaims in terror. The disease is, in fact, no laughing matter. In lupus, the immune system recognizes DNA, the blue print of our bodies, as an invading force and proceeds to destroy it.

This chronic ailment has allowed researchers like Dr. Joan Steitz, a pioneer in biology and the study of mRNA, to explore "snurps"—small nuclear ribonucleoproteins (snRNPs). These little guys are quite handy. They remove a tangle of incoherent garble (introns, the nonsense portions of a transcript), effectively splicing RNA so that only the intelligible part that can actually become a protein is left. That is, snRNPs are integral in forming a useful string of exons (transcript portions) from a vast "waterfall" of introns as Dr. Steitz illustrated while delivering the 22nd Annual Volwiler Distinguished Scientist Lecture at Lake Forest College's Lily Reid Holt Memorial Chapell in October, 2007.

This discovery is essentially a clarification of biology's central dogma: DNA transcription to RNA translation, resulting in protein. It is snRNPs that splice the transcript (removing its introns); the splicing agent was unknown previous to Dr. Steitz's research. She stated that the finding "can shape whole new arenas of discovery."

Our snRNPs go a long way in explaining why a mere *25,000* genes can, after translation, express the multitude of proteins that make life possible, enabling human beings to dominate the top of the food chain.

For instance, the potassium channels in the cochlea, a key component of auditory function, can be expressed in 576 ways resulting in varied auditory ability in humans through the wonder of snRNPs.

But what of the introns discussed earlier? Dr. Steitz made a point of emphasizing that they are "not junk." Little bits of introns, *hand*-picked by snRNPs, are actually a functional part of the translation process. They are known as "snurps," small nuclear RNA (snoRNPs). The snoRNPs help form ribosomes, which are used in translation.

Dr. Steitz also spoke of the new frontier in RNA research, which she described as developing a better understanding of premature stops in the coding region of mRNA. It seems that these premature stops that keep a protein from being expressed properly can actually be detected by RNA and self-corrected!

Dr. Steitz also alluded to the fact that bureaucracy is inhibiting study. In 1977, "a banner year" for her research, she was able to procure crucial serums (containing antibodies) from lupus afflicted patients with little more than a phone call, something not possible for today's researchers. She used the lupus-patient culled antibodies to identify snRNPs; the antibodies acted as bait by binding to the proteins that made Dr. Steitz famous. It was one of the many instances of "serendipity" the scientist experienced that resulted in a breakthrough—in the case of snRNPs, the breakthrough of a lifetime.

The chance acquirement of the lupus antibodies was crucial, because Dr. Steitz was not able to create them in lab animals as she had intended; the famed researcher spoke of her early disappointments when experiments on chickens didn't go her way. It's been a long time since those days. The preeminent scientist (a protégé of the father of the human genome project, James Watson) now claims to derive as much pleasure from teaching students as making new discoveries herself.

"We're just getting started," said Dr. Steitz in reply to a student's question, which may have captured the energy of this field of research. The question—how do snRNPs affect behavior?—remains unanswered.

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