# SEPARATE TOGETHER:

## *MEMBRANES DISTINGUISH ARKANSAS FROM THE PACK*

By Dr. Ranil Wickramasinghe, University of Arkansas

When asked to describe his field of research, he does so in a succinct manner that is a near perfect reflection of his science. "I deal with separations," says Dr. Ranil Wickramasinghe, ARA Academy Member and Distinguished Professor of Chemical Engineering at the University of Arkansas. "I remove unwanted components." Not a single word is wasted – a perfect separation of what is important and what is unnecessary.

The nature of Dr. Wickramasinghe's science may be simple enough, but the impact of his research bears significance on many important aspects of our quality of life. In his highly specialized laboratory, Dr. Wickramasinghe and his team conduct fundamental and applied research in the field of membrane science for use in current and emerging industrial applications.

What is a membrane? "The most prevalent membrane in our lives is our skin," explained Dr. Wickramasinghe. "Skin regulates the passage of substances in and out of the body. The membranes I work with function in much the same way."

Membranes are commonly used to filter waste from water and chemicals essential to industrial and drug manufacturing processes. Unfortunately, the cost of these separations is substantial. Dr. Wickramasinghe, who works to reduce the difficulty of the separation process, has estimated that separation accounts for 10-15 percent of the world energy budget and up to 80 percent of pharmaceutical manufacturing costs. Reducing those costs would provide numerous economic opportunities for Arkansas and beyond.

"Reducing separation costs, that would be a huge boon to existing businesses in Arkansas, which would make our state far more competitive." The agricultural industry, for one, is interested in leveraging Ranil's work to process waste materials (like rice husks) into valuable commodities. Again separation of the valuable compound is often a major part of the manufacturing cost. In fact, SIEV Technologies, a local is advancing approaches for everything from rice husks to ethanol.

The state's industrial membrane research expertise is being parlayed to position Arkansas as an emerging player in one of the most challenging manufacturing sectors: drug production. If we can discover lower cost manufacturing processes, it would provide a great incentive to rapidly grow what is an emerging biotech industry in Arkansas.

Improving membrane technology may provide a competitive edge to Arkansas business, but Dr. Wickramasinghe's work extends far beyond reducing manufacturing costs. Thanks to a $6M grant from the National Science Foundation (NSF), The University of Arkansas is engaged with two other institutions to develop purification membranes for future large-scale manufacturing of viral vectors and "virus like" particles.


"This is very interesting!" said Dr. Wickramsinghe. "Virus vaccines elicit an immune response so that your own defense systems can recognize the real infection and can fight it off. We obtain these 'weaker' versions of viruses from animal cells. Our mission is to develop membranes that separate the valuable viral materials from the materials you can't use – damaged particles, particles that aren't fully formed, plus the proteins and DNA that make up the cell itself. All of that is toxic. You just want the desired viral particles. It's very difficult. It's very costly. If you can find a way to purify the desires virus particles at large scale efficiently, it would significantly reduce costs in vaccine manufacturing."

The next generation or evolution of Ranil's work? Not only would efficient separation processes reduce costs of life saving vaccines, but it could also very well become an Arkansas industry. The University of Arkansas leads the multi-institution Membrane Science, Engineering and Technology (MAST) for which Dr. Wickramasignhe serves as Director. It is supported by over twenty companies, including many of the leading biopharmaceutical companies. The MAST Center is central to creating a well-trained community of membrane scientists and innovators. It is Dr. Wickramasignhe's hope that such a concentration of researchers will position Arkansas as a central hub for biotech companies.

"To get biotech companies to come to Arkansas, there must be a pool of talent and infrastructure," said Dr. Wickramasignhe. "We have the talent. What we need is the infrastructure and the incentives that would locate people here. And that would require more funding."