

building THE CANCER BIOLOGY INSTITUTE

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Yale Cancer Center's Cancer Biology Institute is moving from concept to reality. The Institute was envisioned several years ago by founding Director Joseph Schlessinger, PhD, William H. Prusoff Professor and Chair of Pharmacology at Yale School of Medicine, and a key step in bringing it to life is the recent appointment of Mark A. Lemmon, PhD, as the Institute's new Co-Director and David A. Sackler Professor of Pharmacology. Dr. Lemmon returns to Yale, where he completed his PhD in 1993, from the University of Pennsylvania's Perelman School of Medicine, where he was the George W. Raiziss Professor of Biochemistry and Biophysics as well as Chair of the Department and an Investigator at the Abramson Family Cancer Research Institute.

"We will be building the Cancer Biology Institute from the ground up," said Dr. Lemmon, a biochemist and structural biologist whose research focuses on how molecules work and how cells signal. "It will be a research institute of approximately a dozen faculty laboratories focused on the core science of cancer," he continued, "and will take its place among the burgeoning cluster of new research institutes on Yale's West Campus."

The first question some people have, Dr. Lemmon explained, is why the Cancer Center is planning twelve new labs when so much innovative cancer research is already underway throughout the Cancer Center as well as the greater Yale community? Dr. Lemmon is ready with an answer.

Traditionally, cancer research focuses on a specific type of cancer in a particular organ – pancreas, breast, lung, skin, for example – while trying to understand it and treat it. "It's extremely important to do that, since the treatment and care is of course different in each case. But, as you back up into the science to understand the cellular and molecular basis of these particular cancers," he continued, "you find that ultimately the same core biology is driving all of these cancers – with certain genetic mutations and molecular pathologies being linked to multiple cancers."

The purpose of the Cancer Biology Institute is to study this core biology, with the goal of understanding the common underlying causes of cancer, wherever it appears. Dr. Lemmon believes that the future of cancer research will rely on this type of insight from the basic sciences for the creation of new drugs.

“What we’re really after is a molecular and cellular understanding of cancer and the body’s response to it,” he said. “Each mutated gene encodes a protein that is driving or allowing cell growth, and ultimately we need to understand how all these proteins play together in the big biological system – or biochemical network – that is the cell. Even beyond that, we need to know how the tumor interacts with its environment in the patient. If we can understand these issues when we see a lesion, we can figure out how to attack it pharmacologically – or to help the body attack it.”

For that reason, one of the new labs at the Cancer Biology Institute will focus on understanding genetic changes seen in cancer at the level of biochemical activity. There also will be research labs devoted to non-coding RNAs, epigenetics, cancer metabolism, proteomics, tumor metastasis, DNA repair, signaling networks, chemical biology, cancer immunology, and bioinformatics/computational biology, among other areas.

Dr. Lemmon also wants the Institute to develop mouse models of cancer so that researchers can do animal-based studies that result in new targeted therapies.

Together with Dr. Schlessinger, he has started recruiting scientists to run the Institute’s labs. By the end of this year, in addition to himself and Dr. Schlessinger, he expects to have three more researchers on board, including Kathryn Ferguson, PhD, who studies the molecular mechanisms that regulate signaling. Also a Yale PhD, she is moving her lab from UPenn’s Perelman School of Medicine to join Dr. Lemmon at the Institute. Dr. Lemmon’s next priority is to hire faculty who are experts in epigenetics and in computational biology/bioinformatics.

His goal is to open new labs at the rate of 2-3 per year. By 2020 he expects the Institute to be fully staffed, with 120 people working in a dozen labs. Some of the lab directors will be senior faculty, but most – seven or eight – will be junior people.

“We won’t be hiring people who have already done their best work,” said Dr. Lemmon. “Some of the young researchers starting their independent labs after successful post-docs are most in tune with the latest technologies and are spectacularly good. We want to hire these people as an investment in the future of

cancer research at Yale.”

Dr. Lemmon also emphasizes that the Institute won’t be an ivory tower for basic sciences. “Anyone I hire must be committed to making their research count for cancer,” he said. “We want everything done here to be translational and lead to targeted therapies.” Though he expects the Cancer Biology Institute’s labs to become one of the drivers of basic science at Yale, “they will be driving it based on opportunities emerging from the clinics here,” he said. “I want basic scientists who want to make bridges to the clinical side.”

This bridge, he added, is already in place at the Cancer Center, thanks to the leadership of people such as Thomas J. Lynch, MD, until recently the Director of YCC, Peter G. Schulam, MD, PhD, Director of Yale Cancer Center and Physician-in-Chief of Smilow Cancer Hospital (Interim), and Roy S. Herbst, MD, PhD, Chief of Medical Oncology and Associate Director for Translational Research. Translational Working Groups at YCC are combining basic sciences with clinical research that leads to phase I trials of new drugs. “One of our main goals is to feed that pipeline,” said Dr. Lemmon.

The Institute’s location among other research institutes on Yale’s West Campus, said Dr. Lemmon, is conducive to cross-fertilization and ground-breaking approaches. He expects

productive partnerships with the Chemical Biology Institute, the Systems Biology Institute, the Microbial Sciences Institute, and the Nanobiology Institute. The Cancer Biology Institute also will benefit, he noted, from proximity to the Center for Genome Analysis, with its massive database of information about genetic changes in cancer patients from Smilow Cancer Hospital.

All of these strengths, as well as the chance to build a Cancer Biology Institute with Dr. Schlessinger, lured him back to Yale. “It’s all set up in an ideal way here,” he said. “I also think that as personalized medicine has advanced in cancer, and more and more genetic changes are discovered in cancer, understanding the biochemistry – which is actually the consequence of those changes – has lagged behind. I’m passionate about bringing more biochemistry and functional understanding into personalized medicine – because that’s what we need to figure out in order to develop new drugs to use against cancer.”



Mark A. Lemmon, PhD, Co-Director of the Cancer Biology Institute and David A. Sackler Professor of Pharmacology