



JANOS HAJDU

- AN EXPERIMENTAL PHYSICIST AND BIOLOGIST
- RECEIVED A PhD IN BIOLOGY FROM THE HUNGARIAN ACADEMY OF SCIENCES IN 1980, AND A D.Sc. IN PHYSICS IN 1994
- WORKED AS A LECTURER IN BIOCHEMISTRY/BIOPHYSICS AT CHRIST CHURCH, OXFORD UNIVERSITY, U.K., A PROFESSOR OF PHOTON SCIENCE AT STANFORD UNIVERSITY IN THE USA, A PROFESSOR OF MOLECULAR BIOPHYSICS AT THE UNIVERSITY OF UPPSALA IN SWEDEN, AND AS AN ADVISOR TO THE DIRECTOR OF THE EUROPEAN XFEL IN GERMANY
- A MEMBER OF THE HUNGARIAN ACADEMY OF SCIENCES
- A LEADER OF THE ELIBIO PROJECT AT ELI BEAMLINES
- A RECIPIENT OF THE GREGORI AMINOFF PRIZE FROM THE ROYAL SWEDISH ACADEMY OF SCIENCES FOR HIS FUNDAMENTAL CONTRIBUTIONS TO THE DEVELOPMENT OF X-RAY FREE-ELECTRON LASER-BASED STRUCTURAL BIOLOGY IN 2021

HOW DOES HIS CAREER OF PHYSICIST START

JÁNOS HAJDU HAS A DIPLOMA IN CHEMISTRY, A PH.D. IN BIOLOGY AND A D.Sc. IN PHYSICS. HE STARTED IN “WET BIOCHEMISTRY” IN 1973, CHANGED TO STRUCTURAL BIOLOGY (X-RAY CRYSTALLOGRAPHY) IN 1981, AND MOVED INTO “EXTREME PHOTON SCIENCE” AT AROUND 2000.

- “IN MY EARLY WORK, I EXPLOITED CHEMISTRY TO DETERMINE THE SYMMETRY OF MULTI-SUBUNIT PROTEIN COMPLEXES, AND CHARACTERIZED STRUCTURAL TRANSITIONS IN THESE SYSTEMS. AN INVITATION TO WORK WITH DR. LOUISE N. JOHNSON IN OXFORD LANDED ME IN PROTEIN CRYSTALLOGRAPHY IN JANUARY 1981 AND I SPENT 16 WONDERFUL YEARS IN OXFORD. DURING 1981, THE FIRST DEDICATED SYNCHROTRON RADIATION SOURCE CAME TO LIFE IN DARESBUY, AND I WAS FORTUNATE ENOUGH TO BECOME ONE OF ITS FIRST USERS. FUNCTION IS A FOUR-DIMENSIONAL PROPERTY, AND SYNCHROTRON RADIATION PROVIDED THE FIREPOWER NEEDED FOR OUR FIRST TIME-RESOLVED X-RAY DIFFRACTION EXPERIMENTS. THESE STUDIES PRODUCED THE VERY FIRST MOVIES ON CATALYSIS IN CRYSTALLINE ENZYMES AND REVEALED STRUCTURAL TRANSITIONS IN VIRUSES. DAMAGE TO THE SAMPLE WAS A LIMITATION AND I REALIZED THERE MAY BE A WAY TO OUTFRAN KEY DAMAGE PROCESSES BY USING VERY SHORT AND EXTREMELY INTENSE X-RAY PULSES (SPEED OF LIGHT VS. SPEED OF A SHOCK WAVE).”

- "IN 1996, I TOOK UP A CHAIR AT UPPSALA UNIVERSITY AND SET UP A EUROPEAN RESEARCH NETWORK TO EXPLORE UNTRIED FRONTIERS AT THE PHYSICAL LIMITS OF IMAGING. OUR RESULTS TURNED INTO THE SCIENTIFIC CASE THAT ASSURED FUNDING FOR THE FIRST X-RAY FREE-ELECTRON LASERS (FELs). FEL-BASED IMAGING HOLDS SUBSTANTIAL PROMISE, AND IN 2002 I CONVINCED THE MANAGEMENT OF THE LAWRENCE LIVERMORE NATIONAL LABORATORY (LLNL) TO JOIN IN. THE EXPLICIT MISSION OF LLNL IS THE STEWARDSHIP OF THE NUCLEAR STOCKPILE OF THE USA, AND THEREFORE, IT WAS A PLEASANT SURPRISE TO SEE OUR IMAGING PROJECT BECOMING A STRATEGIC INITIATIVE, WHICH IS THE HIGHEST LEVEL OF RESEARCH AND DEVELOPMENT PROJECTS AT LLNL. THIS IS WHEN HENRY CHAPMAN AND HIS COLLEAGUES JOINED US, AND SOMEWHAT LATER JOHN SPENCE TOO, AND WE HAVE BEEN WORKING TOGETHER EVER SINCE."
- "X-RAY LASERS ARE CREATING UNPRECEDENTED RESEARCH OPPORTUNITIES IN ATOMIC PHYSICS, IN HIGH-ENERGY DENSITY SCIENCE, AND IN BIOLOGY. OUR WORK HAS OPENED UP A FASCINATING RESEARCH AREA, MIXING HIGH-FIELD PHOTON SCIENCE AND PLASMA PHYSICS WITH STRUCTURAL SCIENCES. PRACTICALLY EVERYTHING IS NEW HERE AND A NEW SCIENTIFIC COMMUNITY HAS EMERGED TO EXPLORE THIS WORLD. THIS COMMUNITY DID NOT EXIST TEN YEARS AGO, NOR DID THE REQUISITE X-RAY LASERS."

THE BIGGEST PROFESSIONAL ACHIEVEMENTS IN HIS LIFE

- THE 4TH DIMENSION IN X-RAY CRYSTALLOGRAPHY: FIRST MOLECULAR MOVIES ON CHEMICAL REACTIONS
- DEVELOPMENT OF LAUE CRYSTALLOGRAPHY: FIRST ELECTRON DENSITY MAPS FOR PROTEINS AND VIRUSES
- DISCOVERY OF X-RAY-DRIVEN CATALYSIS IN REDOX ENZYMES
- PROPOSAL FOR A LINK BETWEEN LATE STEPS IN PROTEIN FOLDING AND STRUCTURAL CHANGES IN PROTEIN FUNCTION
- FIRST STRUCTURAL CHARACTERIZATION OF THE FAMILY OF MONONUCLEAR FERROUS ENZYMES
- DISCOVERY OF THE STRUCTURAL BASIS FOR PENICILLIN AND CEPHALOSPORIN FORMATION
- PROPOSAL FOR REACHING FEMTOSECOND TIME-RESOLUTION IN X-RAY DIFFRACTION STUDIES
- "DIFFRACTION BEFORE DESTRUCTION" - ESTIMATES ON THE PHYSICAL LIMITS IN IMAGING WITH X-RAYS
- THE SCIENTIFIC CASE IN IMAGING FOR BUILDING X-RAY FREE-ELECTRON LASERS
- THE SCIENTIFIC CASE IN BIOLOGY FOR BUILDING THE EUROPEAN EXTREME LIGHT INFRASTRUCTURE

JANOS AND ELI BEAMLINES

“THE EUROPEAN EXTREME LIGHT INFRASTRUCTURE IS AN EXCITING PROJECT. I GOT INVOLVED WITH IT IN 2004 IN PARIS, AND IN 2008 I WAS ELECTED AS CO-CHAIR OF THE SCIENTIFIC ADVISORY COMMITTEE OF THE PROJECT.”

“IN 2017 I JOINED ELI BEAMLINES AT DOLNÍ BŘEŽANY. I DO NOT THINK THAT THE SCIENTIFIC CHALLENGES FACING ELI BEAMLINES ARE UNSURMOUNTABLE. THE KEY CHALLENGES HERE ARE TECHNICAL WHILE OTHERS ARE BUREAUCRATIC. EVERY NOW AND THEN ONE GETS THE IMPRESSION THAT BUREAUCRACY IS A GOAL BUILT INTO “THE SYSTEM” INSTEAD OF A MEANS TO ACHIEVE SOMETHING FAST IN AN ORDERLY MANNER. I ADMIRE THE ABILITIES OF OUR FEARLESS LEADERS AT ELI.”