Growing Old in a New Age
How The Body Ages

1 01:00:04:18 Annenberg Media
2 01:00:08:03 §
3 01:00:12:25 w/CPB PROJECT
4 01:00:20:22 IF WE UNDERSTAND HOW BASIC AGING PROCESSES AT A BIOLOGICAL LEVEL WORK, WE MAY BE ABLE TO HAVE A BIG IMPACT ON THE DELETERIOUS CHANGES THAT CHARACTERIZE AGING AS WE CURRENTLY KNOW IT.
5 01:00:33:17 NOW, MANY OF THEM ARE NOT AGING ITSELF.
6 01:00:36:15 THEY ARE A REFLECTION OF DISEASE.
7 01:00:38:28 TODAY, WE ACCEPT PEOPLE IN THEIR 80s AS A NORMAL PART OF LIFE, AND IN FUTURE GENERATIONS, PEOPLE WILL BE LIVING TO BE 110 AND 115, AND HOPEFULLY, WHATEVER RESEARCH IS GOING ON NOW WILL NOT JUST PROLONG THEIR LIVES, BUT GIVE A VERY, VERY GOOD QUALITY TO THEIR LIFE AND THEIR LIFE STYLES.
8 01:01:01:10 HOW AND WHY DOES THE BODY AGE? WHAT THEORIES HAVE SCIENTISTS DEVELOPED TO TRY TO EXPLAIN BIOLOGICAL AGING? WILL FUTURE RESEARCH HELP TO SLOW DOWN THE AGING PROCESS OR HELP US LIVE HEALTHIER LIVES IN OUR LATER YEARS? NEXT, ON... AMERICANS ARE VERY CONSCIOUS OF AGING AND APPEARANCE. WOMEN ARE BOMBARDED WITH COMMERCIALS FOR HAIR AND SKIN PRODUCTS. HAIR REPLACEMENT AND HAIR COLORING ADS APPEAR MORE FREQUENTLY FOR MEN. PEOPLE ARE KEEPING FIT AND SLIM AND PURCHASING BIFOCALS WITH INVISIBLE LINES. BIRTHDAY CARDS REMIND US OF CHANGES IN OUR PHYSICAL APPEARANCE. WHAT CAN WE REALLY EXPECT IN NORMAL AGING? THE FIRST SIGNS WE MAY NOTICE ARE IN OUR SKIN AND HAIR. LAUGH AND FROWN LINES APPEAR. BECAUSE CELLS ARE
REPLACED MORE SLOWLY, THE SKIN'S OUTER LAYER THINS, IS MORE VULNERABLE TO TRAUMA, AND SLOWER TO HEAL. WRINKLING AND DARK SPOTS ON THE SKIN VARY DUE TO SKIN TYPE AND SUN EXPOSURE. I GUESS ABOUT 15 YEARS AGO, I STARTED TO DEVELOP LITTLE BLIPS ON MY LIPS AND ON MY FACE, AND, INDEED, THE BLIP HAD TO BE BURNED OUT.

9 01:02:18:08 IT WAS PRECANCEROUS.

10 01:02:19:21 LATER, ONE UP HERE ACTUALLY TURNED OUT TO BE CANCEROUS.

11 01:02:23:28 SO I'M FOLLOWING A PROGRAM OF, UH...

12 01:02:27:27 PREVENTIVE, REALLY -- I WON'T GO OUTDOORS WITHOUT A HAT, NOR IF I DON'T HAVE MYSELF WELL-COVERED WITH A SUNSCREEN.

13 01:02:37:17 LIFELONG SUN PROTECTION CAN REDUCE AGING OF THE SKIN AND SKIN CANCER FOR EVERYONE, PARTICULARLY THOSE WITH LIGHT SKIN. GOOD SKIN CARE IS IMPORTANT BECAUSE THE SKIN IS OUR BODY'S FIRST LINE OF DEFENSE AGAINST DISEASE. WHAT I NOTICE MOST IS MY SKIN AND THE WRINKLING BECAUSE IN OTHER RESPECTS -- I WENT TO A 50th REUNION AT MY COLLEGE LAST YEAR, AND EVERYBODY KNEW ME, SO I FIGURED I HADN'T CHANGED THAT MUCH.

14 01:03:08:26 FOR ONE THING, I DIDN'T HAVE WHITE HAIR.

15 01:03:11:26 I DIDN'T HAVE DYED HAIR. I WASN'T FAT.

16 01:03:14:27 AND I DIDN'T HOBBLE AROUND, YOU KNOW.

17 01:03:17:27 I WAS STILL PRETTY PEPPY.

18 01:03:19:27 AND SO I DON'T THINK I'VE CHANGED THAT MUCH, EXCEPT FOR THE WRINKLING OF MY SKIN.

19 01:03:26:18 MEN ARE THE FIRST TO NOTICE CHANGES IN THE HAIR BECAUSE MALE PATTERN BALDNESS MAY APPEAR BY THE LATE 20s. GENETICS ARE RESPONSIBLE FOR THIS AND THE EARLY GRAYING EXPERIENCED BY SOME PEOPLE. ACTUALLY, THE HAIR THINS FOR BOTH GENDERS IN AGING BECAUSE
THE DIAMETER OF INDIVIDUAL HAIRS DECREASES, AND FEWER HAIRS ARE REPLACED. GRAYING OCCURS WHEN PIGMENT IS LOST FROM THE HAIR FOLLICLE. CHANGES IN APPEARANCE CAN BRING UNEXPECTED RESULTS. THIS IS, PERHAPS, VERY WELL-ILLUSTRATED BY AN ANECDOTE FROM BERTRAND RUSSELL.

WHEN HE WAS 87, HIS FRIENDS LOOKED AT HIS WHITE HAIR AND SAID, "YOU CAN TAKE THINGS TO TURN YOUR HAIR BLACK AGAIN," AND HE THOUGHT AND SAID, "THE WHITER MY HAIR HAS BECOME, THE MORE LIKELY PEOPLE ARE TO BELIEVE WHAT I SAY." AND SO IT'S LOOKING AT SOMETHING SOME SEE AS A NEGATIVE CHANGE BUT WAS IN -- ADAPTIVE TO SOME PEOPLE.

AS WE GROW OLDER, THE BODY'S COMPOSITION CHANGES, WITH DECREASING PROPORTIONS OF WATER AND LEAN MUSCLE AND INCREASING PROPORTIONS OF FAT. WEAKER MUSCLES AND LESS-ELASTIC LIGAMENTS MAKE GETTING AROUND HARDER. OLDER PEOPLE MOVE MORE SLOWLY. THEIR GAIT MAY CHANGE. I CAN'T SWIM AS MANY LAPS IN THEpool.

I SWIM EVERY DAY IN THE SUMMER.

I CAN'T LIFT THE WAY I USED TO.

I USED TO BE ABLE TO HAUL THIS TABLETOP DOWNSTAIRS.

I CAN'T ANYMORE.

I CAN'T PLANT BUSHES ANYMORE. I USED TO PLANT -- THOSE TWO BUSHES BACK THERE I PLANTED.

I HAD TO DIG A VERY DEEP HOLE.

SO PHYSICALLY, I'M Achy sometimes.

WHEN I GET UP IN THE MORNING, I'M STIFF.

AFTER DOING MY 28 LAPS, I'M STIFF AWHILE, TILL I TAKE A SHOWER.

SO I HAVE LESS STRENGTH.
SUNDAY, I PLAYED PING-PONG, AND I THOUGHT, "I'M REALLY OUT OF PRACTICE," BUT I THOUGHT -- I'M SLOWER, TOO. I'M SLOWER.

SKELETAL CHANGES INCLUDE HEIGHT REDUCTION DUE TO LOSS OF BONE MINERAL AND A GREATER RISK OF BONE THINNING DUE TO OSTEOPOROSIS OR JOINT PAIN DUE TO OSTEOARTHRITIS. ALTHOUGH MILD ARTHRITIS IS COMMON IN AGING, SEVERE ARTHRITIS AND OSTEOPOROSIS ARE DISEASES, NOT PART OF NORMAL AGING. GROWING OLDER BEGINS AT CONCEPTION. IT HAPPENS TO ALL OF US, AND SOME OF US GROW VERY OLD. MANY BELIEVE THAT AGING EQUALS DISEASE OR THAT AGING IS THE ACCUMULATION OF DAMAGE FROM DISEASE. AGING IS NOT A DISEASE. WE HAVE TO DISTINGUISH BETWEEN AGE CHANGES AND DISEASE.

AGE CHANGES ARE GENERALLY NOT THOUGHT TO BE DISEASES.

WHEN MY HAIR TURNS GRAY, I'M NOT ILL, NOR DO I RUN TO A HOSPITAL WHEN MY SKIN BEGINS TO WRINKLE.

OF COURSE, THE CHANGES THAT ARE SUPERFICICALLY APPARENT, LIKE GRAY HAIR AND SKIN THAT'S WRINKLED, ARE VERY SIMPLE REFLECTIONS OF AN ENORMOUS NUMBER OF CHANGES THAT OCCUR AT MUCH MORE SOPHISTICATED LEVELS OF BIOLOGY.

WE STILL DON'T KNOW HOW MUCH OF WHAT WE CALL AGING IS DISEASE BECAUSE WE CAN SEE INDIVIDUALS WHO MAINTAIN REMARKABLE MENTAL ABILITY OR PHYSICAL ABILITY INTO VERY, VERY LATE LIFE AND OTHERS WHO SHOW MARKED IMPAIRMENT.

AND IT'S MORE OUR POSITION THAT THE PEOPLE WHO RETAIN THE ABILITY SHOW THE CAPACITY THAT WE SHOULD BE AIMING FOR.

PEOPLE START AGING FROM THE DAY THEY'RE BORN, AND NO MATTER WHAT ANYONE DOES -- A PERSON CAN HAVE ALL THE FACE-LIFTS AVAILABLE.

THEY CAN HAVE YOUTHFUL DRESSING.
41 01:07:15:17 THEY CAN HAVE ALL OF THE PRODUCTS THAT TELEVISION EMPHASIZES FOR YOUTH, BUT THE FACT REMAINS THAT IF YOU WERE BORN IN 1920, YOU'RE 70 YEARS OLD IN 1990, AND YOUR BODY IS 70 YEARS OLD.

42 01:07:32:29 GETTING OLDER IS NOT A DISEASE.

43 01:07:35:13 IT'S SOMETHING ONE SHOULD BE PROUD OF.

44 01:07:38:27 INDIVIDUALS AGE AT DIFFERENT RATES. MOST OF US HAVE IN OUR FAMILY SOMEONE WE THINK OF AS AN EXAMPLE OF SOMEONE WHO IS AGING VERY SUCCESSFULLY -- AN AUNT MAUDE, IF YOU WILL.

45 01:07:52:28 ON OUR LITTLE CHART OVER HERE, AUNT MAUDE IS ACROSS THE BOTTOM.

46 01:07:57:25 SHE'S OBVIOUSLY AGING AT A SLOWER RATE THAN LOTS OF OTHER PEOPLE.

47 01:08:02:18 SHE'S IN HER 60's NOW.

48 01:08:04:17 SHE STILL DRIVES. SHE'S ACTIVE AND INVOLVED.

49 01:08:07:14 SHE MAY STILL BE WORKING AND HAVE NO NOTION OF EVER QUITTING.

50 01:08:12:11 SHE TRAVELS. SHE'S OBVIOUSLY IN CONTACT.

51 01:08:14:26 YOU KNOW SHE'LL BE AROUND A LONG TIME.

52 01:08:17:25 SHE'S AGING RELATIVELY SLOWLY.

53 01:08:19:19 WE ALSO HAVE AN AUNT WHO'S AGING AT A VERY DIFFERENT RATE.

54 01:08:25:03 THIS IS A PERSON WHO, IN HIS OR HER LATE 40's OR EARLY 50's, WE KNOW WON'T MAKE IT, PROBABLY, TO 65.

55 01:08:33:14 THIS IS A PERSON WHO'S BEGINNING TO LOSE CONTACT ALREADY, HAS SLOWED DOWN, IS NOT AS MUCH FUN TO BE AROUND.

56 01:08:41:25 SOCIAL CONTACTS ARE DRYING UP.

57 01:08:43:26 THEY'RE DROPPING THEIR INVOLVEMENT WITH THE WORLD, AND THEY SEEM TO BE AGING AT A MUCH
WHAT CONTROLS THE AGING PROCESS? ONE MAJOR CLASS OF THEORIES CREDITS THE ENVIRONMENT AS THE MAIN CAUSE OF AGING. ANOTHER CLASS POINTS TO THE IMPORTANCE OF GENETIC DETERMINANTS.

WE AGE BECAUSE OF THE DAMAGE WE GET IN OUR ENVIRONMENT.

WE DO A JOB. WE ENGAGE IN VARIOUS BEHAVIORS. AND EACH OF THOSE THINGS TAKES ITS TOLL, AND THAT CHANCE HITS FROM ENVIRONMENTAL TOXINS...

UM...

STRESSES, AND SO ON, SLOWLY WEAR US DOWN.

WE HAVE, SORT OF BUILT-IN, ENOUGH PROTECTION TO GET US THROUGH LIFE'S WEAR AND TEAR FOR ABOUT 110 YEARS.

SOME MAKE IT. SOME DON'T.

BUT WHAT CONTROLS THE PROCESS IS SIMPLY THE RANDOM EFFECTS OF WHAT STRESSES WE ENCOUNTER IN OUR PERSONAL LIFE SPAN.

THAT'S ONE SET OF THEORIES.

THE OTHER CLASS OF THEORIES ARE THOSE THAT ASSUME BIOLOGICAL PROGRAMS, THAT THERE'S A BIOLOGICAL CLOCK OF SOME KIND, AND THE MOST REASONABLE OF THOSE THEORIES ASSUME THAT THE BIOLOGICAL CLOCK IS SOMEHOW GENETICALLY CONTROLLED.

THE BIBLICAL LIFE SPAN WE WERE ALL ALLOTTED HASN'T CHANGED SINCE BIBLICAL TIMES.

WHAT'S CHANGED IS HOW MANY MAKE IT AND THAT THE MAXIMUM PROBABILITY FOR HUMANS IS ABOUT 115 AND THAT THAT IS A BIOLOGICALLY DETERMINED DEVELOPMENTAL PROGRAM, JUST LIKE WHAT HAPPENS TO US IN EARLY LIFE.

THE CONTROL OF INDIVIDUAL AGING IS PROBABLY A FUNCTION OF BOTH THE ENVIRONMENT AND
GENETICS IN COMBINATION. I think many of the differences between individuals within a species are also genetically programmed, but that interaction with the environment is very significant.

It's one reason I jog four times a week.

I believe the data that says that makes a difference.

I have this mental notion of the guy who smokes before breakfast, and he carefully has his oat bran, doesn't fasten his seat belt and smokes on the way to work.

Basically, I'm saying that, at a personal level, what really makes a difference are life-style changes.

Those are the things that are going to make the big difference in how long individuals live.

In order to understand the aging rates of individuals, scientists have been searching for biomarkers of aging. All of us are probably pretty good at judging the rate at which people around us are aging.

There are no scientific measures to do that.

We've found, so far, no measures that are good, accurate predictors of how long an individual organism will live.

Such measures would be biomarkers of aging.

That's what the whole biomarker strategy is aimed at, is to find those kinds of measures, so that if we try an intervention to change the rate at which an individual ages, we'll have measures that tell us whether we've succeeded.

Although no certain biomarkers have been confirmed for humans, reduced caloric intake is one intervention which affects
BIOMARKERS IN ANIMAL EXPERIMENTS. THERE IS ONE INTERVENTION NOW THAT WE KNOW DOES WORK IN EVERY SUBJECT POPULATION IT'S BEEN TRIED IN, FROM DROSOPHILA, WHICH ARE FRUIT FLIES, THROUGH MICE AND RATS, AND IT'S CURRENTLY BEING TESTED IN RHESUS MONKEYS -- AND THAT'S CALORIC RESTRICTION.

82 01:12:21:23 THIS IS NOT WHAT MOST OF US WANT TO HEAR, BUT IF YOU REDUCE THE CALORIC INTAKE OF ORGANISMS LIKE MICE AND RATS TO 65% OF WHAT THEY WOULD EAT IF ALLOWED TO EAT FREELY, AD LIBITUM, UM...

83 01:12:40:02 YOU EXTEND THEIR LIFE SPAN BY 35%.

84 01:12:43:03 THAT'S A HUGE, DRAMATIC INCREASE IN LIFE EXPECTANCY.

85 01:12:46:02 THE SURPRISE WE'VE HAD NOW DOING THIS WITH FIVE DIFFERENT TYPES OF MICE AND THREE DIFFERENT TYPES OF RATS IS THE DISCOVERY THAT IT DELAYS ALL TYPES OF TUMORS.

86 01:12:57:11 EVERY SINGLE TUMOR TO WHICH THESE ANIMALS ARE SUSCEPTIBLE IS EITHER DELAYED OR ELIMINATED, AND MOST OF THE OTHER DELETERIOUS CHANGES THAT WE ASSOCIATE WITH AGING ARE DELAYED OR ELIMINATED.

87 01:13:09:17 SO IT HAS A VERY, VERY BENEFICIAL EFFECT.

88 01:13:12:17 A KEY TO THAT IS THAT WE MAINTAIN ADEQUATE NUTRITION.

89 01:13:16:17 I THINK THAT'S AN IMPORTANT POINT TO KEEP IN MIND BECAUSE I THINK IT WOULD BE TERRIBLE TO SUGGEST THAT A 35% REDUCTION IN CALORIC INTAKE WITHOUT ADEQUATE NUTRITION, VITAMINS, AND SO ON, IS GOING TO BE THE KEY TO A LONG LIFE.

90 01:13:34:28 WE DON'T HAVE A REALLY GOOD HUMAN PARALLEL TO THAT RESEARCH YET, AND IT'S DIFFICULT TO THINK HOW TO DO IT BECAUSE MOST PEOPLE ARE UNWILLING TO PRACTICE THAT SEVERE A CALORIC RESTRICTION FOR A LIFETIME, THOUGH THERE ARE PEOPLE WHO ARE ARGUING THAT WE'RE READY FOR A CLINICAL TRIAL OF CALORIC RESTRICTION IN HUMANS NOW.
I THINK THAT’S IRRESPONSIBLE AT THIS POINT.

A NUMBER OF PEOPLE IN THE U.S. ARE PRACTICING IT VOLUNTARILY, EATING EVERY OTHER DAY, AS YOU CAN DO IT IN ANIMALS AS WELL.

SO THAT’S ONE VERY PLAUSIBLE INTERVENTION THAT’S HIGHLY LIKELY TO BE TRIED BY HUMANS BEFORE THE END OF THIS CENTURY, CERTAINLY.

INSTEAD OF INVESTIGATING THE CAUSES OF AGING, DR. LEONARD HAYFLICK IS ASKING ANOTHER QUESTION -- WHY DO WE LIVE AS LONG AS WE DO? AND THAT ONCE WE UNDERSTAND WHY WE LIVE AS LONG AS WE DO -- THAT IS, WHY WE HUMANS, FOR EXAMPLE, LIVE TO BE A MAXIMUM OF ABOUT 115 YEARS -- ONCE UNDERSTANDING HOW THAT HAS HAPPENED -- MANY PEOPLE THINK THAT’S AN EASIER QUESTION TO ANSWER -- WE WILL BE IN A BETTER POSITION TO UNDERSTAND WHAT CHANGES OCCURRED DURING THAT PERIOD -- THAT IS, FROM SEXUAL MATURATION, SAY, FROM 20-25 TO 115.

WE WOULD BE IN A BETTER POSITION TO UNDERSTAND WHAT THOSE CHANGES ARE.

WELL, IF YOU LOOK AT VERY OLD PEOPLE -- CENTENARIANS AND PEOPLE OF THAT SORT -- THEY JUST SEEM TO GO ON FOREVER, AND ACTUALLY, THEY OFTEN LOOK A LOT YOUNGER.

IT MAY BE THAT WHAT WE'RE SEEING IN VERY OLD PEOPLE THAT DO VERY WELL IS A GOOD GENE THAT PREVENTS THEM FROM GETTING CORONARY ARTERY DISEASE OR TYPE-II DIABETES, AND THEY'RE SHOWING US WHAT NORMAL AGING SHOULD BE SEPARATE FROM DISEASE.

THAT’S OUR WORKING HYPOTHESIS.

THE NATIONAL INSTITUTE ON AGING HAS HAD AN ACTIVE RESEARCH PROGRAM SINCE THE 1970s SEEKING TO UNDERSTAND THE AGING PROCESS. THE INSTITUTE’S RESEARCH HAS EVOLVED IN THREE PHASES -- THE FIRST WAS THE FOCUS OF RESEARCH BEGUN IN THE MID-1970s THAT STILL IS CURRENT TODAY -- THE FOCUS ON SEPARATING OUT CHANGES THAT REPRESENT NORMAL AGING CHANGES FROM
THOSE THAT REPRESENT ILLNESS IN LATER LIFE.

FOLLOWING THAT, THERE WAS THE BEGINNING REALIZATION THAT, GIVEN THE FACT THERE WERE PROBLEMS, WHAT COULD YOU DO ABOUT THEM.

AND THAT LED TO A SECOND MAJOR FOCUS OF RESEARCH ON AGING AND ATTENTION TO MODIFYING PROBLEMS, MODIFYING ILLNESS, TREATING ILLNESS.

AND NOW WE'RE IN A THIRD PHASE.

THOSE TWO PHASES CONTINUE, BUT IT'S ALSO RECOGNIZED THAT THERE'S A LOT YOU CAN DO TO PROMOTE HEALTH, AND THAT HAS GIVEN RISE TO A SERIES OF NEW STUDIES, ALL OF WHICH ARE EXCITING, VERY MUCH NEW-FRONTIER TYPES OF INVESTIGATIONS THAT ARE GOING ON -- WHOLE NEW CONCEPTS COMING IN AS TO WHAT AGING CAN BE LIKE.

A MAJOR STUDY FUNDED BY THE NATIONAL INSTITUTE ON AGING IS THE BALTIMORE LONGITUDINAL STUDY ON AGING. THIS STUDY BEGAN THROUGH THE EFFORTS OF DR. NATHAN SHOCK AND W.W. PETERS, A RETIRED SCIENTIST. MR. PETERS HAD COME TO DR. SHOCK SAYING, "I WANT TO DONATE MYSELF TO SCIENCE," AND DR. SHOCK REPORTEDLY TOLD HIM THAT WHAT HE NEEDED WAS NOT SOMEBODY AFTER THEY HAD DIED, BUT REALLY, WHILE THEY WERE ALIVE.

THROUGH MR. PETERS' AND DR. SHOCK'S EFFORTS, MR. PETERS HELPED TO RECRUIT A NUMBER OF RETIRED SCIENTISTS FROM THE FEDERAL GOVERNMENT WHO WERE INTERESTED IN PARTICIPATING IN A LONGITUDINAL STUDY THAT WOULD TRY TO EXPLAIN WHAT KINDS OF CHANGES OCCURRED AS WE AGE.

IN THE LATE FIFTIES AND IN THE SIXTIES, THERE WAS A GENERAL CONCEPTION THAT BEING OLD WAS BAD, AND THROUGH THE STUDIES DR. SHOCK HAD BEEN DOING IN THE FORTIES, THE FIFTIES, AND WITH THE STARTING OF THE LONGITUDINAL STUDY, THEY HOPED TO REALLY LOOK AT THOSE MYTHS AND TO TRY TO REALLY DESCRIBE WHAT KINDS OF CHANGES
OCCUR AS WE GET OLDER, WHICH OF THESE CHANGES ARE DUE TO AGING ITSELF, AND WHICH OF THESE CHANGES ARE DUE TO OTHER FACTORS, SUCH AS DISEASE, THE ENVIRONMENT, OUR LIFE STYLE.

AND SO, IN 1958, THE LONGITUDINAL STUDY WAS STARTED, AND THE STUDY CONTINUES TODAY.

THE STUDY WAS ORIGINALLY SET UP AND STUDIED MEN FROM 1958 TO 1978.

IN 1978, WOMEN STARTED TO ENTER THE STUDY.

MY HUSBAND WAS A PARTICIPANT IN THE STUDY FOR A VERY LONG TIME.

I CAN'T SAY HOW MANY YEARS, BUT MORE THAN 10.

NEAR THE BEGINNING, I THINK, HE GOT IN, AND WE HAD A FRIEND WHO WAS ONE OF THE TOP DOCTORS ON THIS STUDY, AND I USED TO TEASE HIM THAT THEY DIDN'T HAVE ANY WOMEN IN THE PROJECT AND SAID I WOULD SUING THEM.

AND SO THEN MY HUSBAND DIED IN '77.

OF COURSE, I WAS BUSY, AND ALL OF THE SUDDEN, I GOT A CALL SAYING, "WE NOW HAVE WOMEN, SO WE WANT YOU." AND IT WAS NOT A VERY CONVENIENT TIME, BUT I THOUGHT AFTER THAT FUSS I MADE, I SHOULD COME IN, SO I DID IN '78.

DONALD McCLURE SHARES HIS EXPERIENCE AS A PARTICIPANT IN THE LONGITUDINAL STUDY. WELL, A TYPICAL VISIT, YOU COME IN.

OF COURSE, THEY DO A COMPLETE PHYSICAL WORKUP ON YOU.

THEY DO A SERIES OF TESTS.

THEY DO A COMPLETE PHYSICAL EXAMINATION.

THEY DO SUCH TESTS AS A GLUCOSE-TOLERANCE TEST.

THEY DO SUCH TESTING AS THE TREADMILL WALK.
121 01:19:47:24 LOOSEN THAT GRIP A LITTLE.
122 01:19:49:23 THEY DO NEUROLOGICAL TESTING, TESTING OF THE MEMORY.
123 01:19:53:14 AND BASICALLY, WHAT THEY'RE DOING IS DRAWING A BASE LINE FOR EACH INDIVIDUAL SO THAT THEY CAN MONITOR THAT AS TIME MOVES ON TO SEE HOW MUCH YOU CHANGE AND WHAT THE EFFECT THAT AGING HAS ON EACH INDIVIDUAL.
124 01:20:09:16 SO EACH INDIVIDUAL ESTABLISHES A BASE LINE FOR HIMSELF.
125 01:20:13:15 THEN, IF THEY IDENTIFY SOMETHING THAT'S UNUSUAL, THEY TELL YOU ABOUT IT, AND YOU FOLLOW IT UP WITH YOUR OWN PHYSICIANS.
126 01:20:23:01 THE BALTIMORE STUDY HAS REVEALED THAT AMONG THESE HEALTHY, HIGHLY MOTIVATED PARTICIPANTS, LONGEVITY EXCEEDS THAT FOUND IN THE GENERAL POPULATION. FOR EXAMPLE, ONE OF THE STRIKING FINDINGS IN THE BLSA IS THE LONGEVITY OF OUR POPULATION.
127 01:20:39:07 ON THE AVERAGE, MEN IN THE STUDY LIVE ABOUT EIGHT YEARS LONGER THAN THE GENERAL POPULATION.
128 01:20:46:02 OUR POPULATION LIVES, ON THE AVERAGE, TO 84.
129 01:20:49:01 WELL, WHAT FACTORS CONTRIBUTE TO THIS LONGEVITY?
130 01:20:52:01 ONE MAJOR AREA WHERE WE'VE SEEN THAT IS IN OBESITY.
131 01:20:56:14 THOSE INDIVIDUALS THAT ARE QUITE OBESE, INSTEAD OF LIVING TO AN AVERAGE AGE OF 84 -- IN THE MEN, AGAIN -- LIVE TO AN AVERAGE AGE OF BETWEEN 81 AND 82.
132 01:21:08:08 THERE ARE OTHER FACTORS, THOUGH, THAT SEEM TO ADD YEARS TO LIFE, ONE OF WHICH IS THE ISSUE OF SMOKING.
133 01:21:16:07 INDIVIDUALS THAT DON'T SMOKE SEEM TO ADD TWO TO THREE YEARS TO THIS ALREADY LONG-LIVED
Growing Old in a New Age: How The Body Ages

134 01:21:40:11 IN THEIR HEALTH AND ARE VERY INTERESTED IN HEALTH EDUCATION.

135 01:21:45:10 PARTICIPATING IN A STUDY CAN CHANGE YOUR OUTLOOK ON AGING. IT'S MADE ME, UM...

136 01:21:52:19 MORE CONSCIOUS OF THE PROCESS OF AGING.

137 01:21:55:29 I GUESS SOME PEOPLE, OR MOST PEOPLE PROBABLY ARE NOT AS AWARE OF WHAT'S HAPPENING TO THEM AS THE PEOPLE WHO PARTICIPATE IN THIS PROGRAM.

138 01:22:06:13 I DON'T THINK WE'RE GOING TO JUST WAKE UP ONE DAY AND FIND OUT WE'RE OLDER.

139 01:22:13:03 I THINK WE KNOW IT'S HAPPENING DAY BY DAY.

140 01:22:16:18 MAYBE SOME PEOPLE DON'T WANT TO KNOW THAT, BUT I DON'T HAVE ANY PROBLEM WITH IT.

141 01:22:22:21 I'LL GET OLDER WHETHER I'M IN THIS PROGRAM OR NOT.

142 01:22:26:26 SCIENTISTS FROM DIFFERENT FIELDS WORK TOGETHER AS THEY ATTEMPT TO UNLOCK THE SECRETS OF AGING. THERE'S ENORMOUS AMOUNT OF COLLABORATIVE RESEARCH ACROSS THE LABORATORIES, AND THAT'S REALLY OUR STRENGTH.

143 01:22:40:08 SO THAT...

144 01:22:41:24 THE INDIVIDUALS THAT ARE EXPERTS IN CARDIOVASCULAR DISEASE CAN TURN TO EXPERTS ON MUSCLE-SYSTEM FUNCTION AND ASK FOR, WHAT ARE THE RELATIONSHIPS BETWEEN CARDIOVASCULAR FITNESS AND MUSCLE FITNESS?

145 01:22:56:05 WHAT ARE THE RELATIONSHIPS BETWEEN CARDIOVASCULAR DISEASE AND NUTRITION?
Growing Old in a New Age: How The Body Ages

146 01:23:00:23 AND SO ON.

147 01:23:02:18 SO THAT WE'RE IN A VERY STRONG POSITION TO LOOK AT THE INTERACTIONS ACROSS SYSTEMS AND WHAT THEIR LONG-TERM EFFECTS ARE, WHAT THEIR IMMEDIATE EFFECTS ARE, AND HOW THEY AFFECT HOW AN INDIVIDUAL AGES, SO THAT THIS IS ONE OF THE MAJOR STRENGTHS OF OUR STUDY, AND THIS IS ONE OF THE REASONS THE STUDY HAS CONTRIBUTED AS MUCH AS IT HAS OVER THE LAST 30 YEARS.

148 01:23:31:08 MAJOR FINDINGS FROM THIS STUDY SHED NEW LIGHT ON AGING. A MAJOR BENT OF THE STUDY HAS REALLY BEEN TO DISPEL MANY OF THE MYTHS ABOUT AGING AND THAT AGING IS A PROCESS OF DETERIORATION, AND THROUGH A NUMBER OF STUDIES AND THROUGH JUST KNOWING THE SUBJECTS IN THE STUDY, IT'S CLEAR THAT MANY ELDERLY PEOPLE MAINTAIN A VERY ACTIVE AND PRODUCTIVE LIFE EVEN INTO THEIR MOST SENIOR YEARS.

149 01:24:06:15 WHAT ARE THE EFFECTS OF AGING ON THE HEART AND ON CIRCULATION? IN THE PAST, IT WAS THOUGHT THAT PERHAPS AGING WAS SYNONYMOUS WITH CORONARY ARTERY DISEASE BECAUSE THE TWO WERE SO INTERTWINED, BUT THERE ARE A SUBSTANTIAL NUMBER OF INDIVIDUALS WHO DO NOT HAVE CORONARY DISEASE, AND THEIR HEART FUNCTION IS PRETTY WELL-PRESERVED.

150 01:24:30:01 CARDIAC OUTPUT AT REST IS WELL-MAINTAINED.

151 01:24:33:04 THE HEART WALL MIGHT BE MODESTLY THICKENED DUE TO THE ENLARGEMENT OF THE HEART CELLS, AND THAT RELATES TO THE STIFFENING OF THE BLOOD VESSELS.


153 01:24:57:07 HOWEVER, THE PICTURE CHANGES WHEN OLDER PEOPLE ARE NOT RESTING BUT ARE PHYSICALLY
ACTIVE. IT'S WELL-RECOGNIZED THAT THE AEROBIC CAPACITY OR THE ABILITY TO DO PHYSICAL WORK DECREASES WITH AGING.

THE COMMUNICATION BETWEEN THE HEART AND THE BLOOD VESSELS DETERIORATES WITH AGING.

THIS STILL ALLOWS FOR THE OLDER CARDIOVASCULAR SYSTEM TO PERFORM HIGH LEVELS OF WORK, BUT IT DOES IT IN A DIFFERENT WAY AND LESS EFFICIENTLY.

IT DOES IT WITH A DILATED HEART, WHICH IS NOT THE BEST CASE FOR EFFICIENT PUMPING OF BLOOD.

STILL THIS REDUCTION IS NOT AS SEVERE AS IS OBSERVED IN INDIVIDUALS WITH HEART FAILURE.

AND ALTHOUGH THE AEROBIC CAPACITY OF THE OLDER INDIVIDUAL DECLINES, THE OVERALL CARDIAC OUTPUT IS STILL FAIRLY WELL-PRESERVED, AND HEALTHY OLDER INDIVIDUALS ARE CAPABLE OF VERY VIGOROUS EXERCISE FOR SUSTAINED PERIODS OF TIME.

AND OLDER INDIVIDUALS WHO CANNOT PERFORM VIGOROUS PHYSICAL ACTIVITY -- ONE MUST BEGIN TO THINK OF HIDDEN CORONARY DISEASE, SEVERE PHYSICAL DECONDITIONING, OR SOME INTERACTION OF THOSE WITH AGING.

STIFFENING OF THE BLOOD VESSELS, WHICH PLACES MORE DEMAND ON THE HEART TO PUMP BLOOD, APPEARS TO BE RELATED TO AGE IN OUR SOCIETY, HOWEVER, FINDINGS FROM OTHER CULTURES SUGGEST A LIFE-STYLE LINK. IN MANY PRIMITIVE SOCIETIES IN WHICH INDIVIDUALS DO A LOT MORE EXERCISE THAN WE DO IN WESTERN SOCIETIES AND IN WHICH SALT IS NOT CONSUMED, BLOOD PRESSURE DOES NOT INCREASE WITHIN THIS NORMAL RANGE WITH AGING, AND THE ARTERIES DO NOT BECOME STIFFER.

DR. MICHAEL CROW HAS BEEN CONDUCTING RESEARCH ON THE STIFFENING OR HARDENING OF ARTERIES, OR ATHEROSCLEROSIS, IN AGING. ATHEROSCLEROSIS ACTUALLY MEANS "HARDENING OF THE ARTERIES," AND IT INVOLVES OCCLUSION OF
THE VESSEL SO THAT BLOOD FLOW IS IMPEDED TO DOWNSTREAM TISSUES, AND IT'S PRIMARILY SEEN IN THE CORONARY CIRCULATION, WHERE IT HAS ITS MOST DRAMATIC EFFECTS ON DEPRIVING THE HEART OF OXYGEN THAT'S NEEDED FOR CONTRACTION.

162 01:27:14:13 CONSEQUENTLY, THERE'S A HIGH INCIDENCE OF INFARCTION, OR DEPRIVED BLOOD FLOW TO THE TISSUE.

163 01:27:20:14 THE PRIMARY CAUSE OF A HEART ATTACK IS THE LACK OF BLOOD FLOW DUE TO OCCLUSION OF THE CORONARY ARTERIES BY ATHEROSCLEROSIS.

164 01:27:30:17 DR. CROW IS STUDYING HOW CELLS PROLIFERATE AND MIGRATE FROM THE OUTSIDE TO THE INSIDE OF BLOOD VESSELS, CAUSING ATHEROSCLEROSIS, OR HARDENING OF THE ARTERIES. OUR FOCUS IN THE LABORATORY IS EXAMINING HOW THESE GENES THAT ARE CONTROLLING THESE PROTEINS THAT ALLOW THE CELLS TO MIGRATE ACROSS TISSUE BARRIERS -- HOW THAT IS CONTROLLED IN THE ATHEROSCLEROTIC PROCESS, AND THAT'S A POTENTIALLY IMPORTANT AREA FOR DEVELOPMENT.

165 01:27:57:00 AS WE UNDERSTAND TO CONTROL THE PROCESS THAT CAUSES THE CELL TO MIGRATE, WE SHOULD BE ABLE TO DEVELOP NEW AND NOVEL STRATEGIES FOR BREAKING -- AND ACTUALLY, IN SOME RESPECTS, ATHEROSCLEROSIS IS A WOUNDING RESPONSE IN THAT THE VESSEL HAS IN SOME WAY BEEN INJURED, AND MUCH AS WHEN WE CUT OURSELVES, WE ACTIVATE THIS ENTIRE WOUNDING RESPONSE, IN MANY RESPECTS, THE ATHEROSCLEROTIC PROCESS IS SIMILAR TO A WOUNDING RESPONSE.

166 01:28:25:02 INTENSE RESEARCH IS NOW GOING ON TO UNDERSTAND HOW THE BLOOD VESSEL Responds TO INJURY AND TRIES TO REPAIR ITSELF, RESULTING IN HARDENING OF THE ARTERIES. THERE HAVE BEEN A LOT OF IMPORTANT DISCOVERIES MADE EVEN OVER THE LAST YEAR.

167 01:28:41:16 I THINK WE'RE A COUPLE OF YEARS AWAY -- MAYBE FIVE YEARS -- FROM FULLY UNDERSTANDING THE BASIC PROCESS.
WE'RE PROBABLY 10 TO 15 YEARS AWAY FROM THE AVAILABILITY OF DRUGS TO ALTER THAT PROCESS.

THE RESEARCH FINDINGS ON THE HEART AND BLOOD VESSELS HAVE IMPORTANT IMPLICATIONS FOR OLDER PEOPLE. IN THE PAST, IT'S BEEN THOUGHT THAT AGING IS ASSOCIATED WITH AN OBLIGATORY AND MARKED DECLINE, PROGRESSIVE DECLINE OVER THE ADULT YEARS IN OVERALL CARDIOVASCULAR FUNCTION.

THE MORE RECENT FINDINGS THAT THIS NOT NEED BE TRUE MEANS THAT THE OUTLOOK FOR OLDER INDIVIDUALS WITH RESPECT TO THEIR FUNCTIONAL CAPACITY IS BRIGHTER THAN BEFORE, ESPECIALLY IN THEIR ATTITUDE ABOUT THEMSELVES AND WHAT THEY CAN ACHIEVE AND WHAT THEY CAN OR CAN'T DO.

CHANGES THAT DO OCCUR WITH AGING WHICH IMPAIR FUNCTIONAL ABILITY TO SOME EXTENT CAN BE PARTLY OVERCOME BY REGULAR PHYSICAL CONDITIONING AND TREATMENT OF DISEASE WHEN IT'S NOTED.

AS WE HAVE SEEN, THE SELF-HEALING ABILITY OF THE SKIN AND BLOOD VESSELS DECLINES WITH AGE. THE IMMUNE SYSTEM IS ALSO LESS EFFECTIVE IN PROTECTING THE BODY FROM ILLNESS. WHAT IS SEEN WITH AGING, WITH A DECREMENT OF LYMPHOCYTE FUNCTION, OR CELL-MEDIATED FUNCTION, IS AN INCREASE IN THE INCIDENCE OF CANCER, AN INCREASE IN THE INCIDENCE OF ANY INFECTIOUS ILLNESS, AND A MORE SERIOUS OUTCOME OF THOSE INFECTIONS OR THE TUMOR GROWTH, SO THAT DISEASE IS MORE COMMON IN THE ELDERLY, AND IT'S MORE SERIOUS, AND IT RELATES PRIMARILY TO THE LACK OF ABILITY TO EITHER NOT DEVELOP THE DISEASE OR WHEN YOU DEVELOP THE DISEASE, TO GET RID OF IT OR TO BECOME HEALTHY AFTER THE DISEASE.

IF YOU LOOK AT THE YEARLY WINTERTIME RESPIRATORY DISEASE PATTERN IN THE UNITED STATES, YOU FIND A VERY INTERESTING PHENOMENA IN WHICH INDIVIDUALS WITH A RESPIRATORY DISEASE NECESSITATING HOSPITALIZATION -- YOU'LL

174 01:31:22:01 THIS ILLUSTRATES TWO THINGS -- THAT THE ELDERLY CAN BE AS EASILY INFECTED AS CHILDREN, YET THE OUTCOME OF THAT INFECTION IS MUCH MORE SERIOUS.

175 01:31:33:02 MAINTAINING A HEALTHY IMMUNE SYSTEM THROUGH NUTRITION AND REGULAR IMMUNIZATION AGAINST DISEASE CAN HELP OLDER PEOPLE RETAIN GOOD HEALTH. THE MAINTENANCE OF IMMUNE FUNCTION WOULD DEPEND IN LARGE MEASURE ON SOME FACTORS WHICH WE CANNOT DEAL WITH AT THE PRESENT TIME, WHICH WOULD BE GENETICS.

176 01:31:53:16 IT MAY ALSO RELATE TO MAINTAINING AN EXCELLENT NUTRITION BASIS, AND NUTRITION MAY BE ONE OF THE KEYS OF MAINTAINING IMMUNE FUNCTION THROUGHOUT LIFE.

177 01:32:03:27 RECENT STUDIES EXAMINE THE ROLES CERTAIN VITAMINS PLAY IN BOOSTING IMMUNITY IN HUMANS. RESEARCHERS MEASURED BLOOD SERUM LEVELS OF VITAMINS E AND C AND FOUND THAT INCIDENCES OF CANCER AND CARDIOVASCULAR DISEASES WERE LESS IN INDIVIDUALS WITH HIGHER LEVELS OF THESE VITAMINS IN THEIR BLOOD. ANOTHER KEY TO MAINTAINING IMMUNE FUNCTIONS IS OFTEN OVERLOOKED. IMMUNIZATION FOR THE FLU AND PNEUMOCOCCAL VACCINATIONS FOR PNEUMONIA COULD SAVE MANY LIVES. I THINK IT’S IMPORTANT TO MAINTAIN THE IMMUNIZATION PROFILE ON THE AGING INDIVIDUAL.

178 01:32:37:17 THERE ARE VACCINES DEVELOPED FOR THE AGING INDIVIDUAL, ONE OF THEM BEING THE INFLUENZA VACCINE, WHICH IS RELEASED YEARLY.

179 01:32:45:07 THE SECOND IS THE PNEUMOCOCCAL VACCINE, WHICH IS RECOMMENDED FOR PEOPLE OVER AGE 50.
IN THE UNITED STATES, WE HAVE PERHAPS ONLY 20% OF THE POPULATION THAT IS BEING TOLD TO GET IMMUNIZED WITH INFLUENZA ACTUALLY GOING AND BEING IMMUNIZED, AND WE HAVE PERHAPS ONLY 10% OF THE POPULATION OVER AGE 50 WHO ARE IMMUNE TO THE PNEUMOCOCCAL USING THE PNEUMOCOCCAL VACCINE.

SO EVEN THOUGH WE HAVE METHODS THAT ARE PERHAPS 70% TO 80% EFFECTIVE IN TERMS OF PREVENTING ILLNESS, THEY'RE NOT BEING USED ON A PUBLIC HEALTH BASIS.

IT'S ONLY BEEN RECENTLY THAT MEDICARE HAS COVERED THE USE OF THESE VACCINES.

THAT IS THE CASE NOW, SO THERE SHOULDN'T BE A PROBLEM IN INDIVIDUALS BEING ABLE TO AFFORD THAT PROTECTION.

CERTAINLY, IT WOULD MEAN A LARGE DECREMENT IN HOSPITALIZED INDIVIDUALS, A SAVING OF A LOT OF MONEY, AND THE PREVENTION OF ILLNESS AND DEATH IN A POPULATION AT RISK.

ACQUIRED IMMUNE DEFICIENCY SYNDROME, OR AIDS, IS ALSO PRESENT AMONG OLDER ADULTS. AIDS IS NOT ONLY A DISEASE OF THE YOUNG. [ADLER] THE AIDS EPIDEMIC AFFECTS PEOPLE IN ALL AGES, AND THERE ARE MANY PEOPLE OVER THE AGE OF 60 WHO ARE HIV-INFECTED.

IN FACT, THERE ARE MORE PEOPLE OVER AGE 60 HIV-INFECTED THAN THERE ARE PEOPLE UNDER THE AGE OF 20.

THE PROBLEMS WITH AIDS IN THE OLDER GROUP -- AND WE'RE TALKING ABOUT PEOPLE OVER AGE 40 -- IS THAT THE DISEASE DEVELOPS MORE RAPIDLY AFTER INFECTION, SO THAT THE DISEASE IS MORE SERIOUS, IT DEVELOPS MORE RAPIDLY, AND IT LEADS TO DEATH IN LESS TIME.

THE QUESTIONS WE'VE BEEN WORKING WITH IS WHY THAT MIGHT BE THE CASE.

IT APPEARS THAT THE DESTRUCTION OF THE LYMPHOCYTES DUE TO THE HIV, THE IMMUNE
DEFICIENCY VIRUS, IS ABOUT THE SAME RATE IN ALL AGE GROUPS, BUT WHAT APPEARS TO BE THE PROBLEM IN THE OLDER AGE GROUPS IS THAT THE DEVELOPMENT OF NEW LYMPHOCYTES IS SLOWED DOWN.

THEREFORE, THERE'S LESS OF A REPLACEMENT.

THE NET EFFECT IS A MORE RAPID LOSS OF THE LYMPHOCYTES IN THE OLDER AIDS PATIENTS.

THIS, THEN, LEADS TO A MUCH MORE SERIOUS COMPROMISE OF THEIR IMMUNE FUNCTION AND A MUCH MORE SERIOUS OUTCOME.

ANOTHER IMPORTANT SYSTEM TO SHOW CHANGES IS THE NERVOUS SYSTEM -- THE BRAIN, SPINAL CORD, AND SENSORY AND MOTOR NERVES SERVING THE REST OF THE BODY. IN AGING, NERVOUS SYSTEM SLOWING OCCURS, AFFECTING OUR REACTION TIME. I LIKE TO PLAY TENNIS, TOO, AND, OF COURSE, I'VE NOTICED I CANNOT PLAY SINGLES.

IT'S GOT TO BE DOUBLES.

TIMING IS JUST NOT THERE QUICK ENOUGH.

THE WILL IS THERE, THE SPIRIT, BUT THE PHYSICAL -- YOU JUST CAN'T SEEM TO REACT QUICK ENOUGH.

SO FROM THAT STANDPOINT, YOU HAVE TO FACE THE FACT THAT YOU DON'T HAVE A 16-YEAR-OLD BODY ANYMORE, BUT YOU JUST GO ALONG AND BEND WITH THAT.

I GUESS, QUITE HONESTLY, I'M MOST AWARE OF THAT WHEN I DECIDE I'M GOING TO PLAY BASKETBALL WITH MY SONS WHO ARE NOW 23 AND 20.

WELL, THAT'S QUITE AN UNDERTAKING WHEN I GET INVOLVED IN IT.

I REALIZED THAT I'M NOT QUITE THE SAME MAN THAT I WAS AT 35.

LUCKILY, I DON'T HAVE TO PLAY 20- AND 23-YEAR-OLDS TO MAKE A LIVING.
PLAYING BASKETBALL WITH OTHER 50-YEAR-OLDS IS NO PROBLEM.

IT'S ONLY WHEN I DROP BACK WITH THE 20-YEAR-OLDS, THEN YOU REALIZE SOME CHANGES HAVE TAKEN PLACE.

OFTEN TIMES, THAT'S THE ONLY WAY YOU'LL KNOW, IS WHEN YOU MOVE OUT OF ONE ELEMENT AND MOVE INTO ANOTHER ELEMENT.

I ALSO PLAY TENNIS WITH MY YOUNGER SONS.

I'VE GOT ONE THAT'S 11.

HE'S HITTING THE BALL PAST ME.

BUT ALL THOSE THINGS WILL START TO HAPPEN TO YOU WHEN YOU GET AROUND 50.

HE'S STARTING TO MOVE ME AROUND A LITTLE BIT.

I ENJOY THAT BECAUSE IT'S A CHALLENGE TO KEEP UP WITH THEM.

I THINK IT'S SOMETHING YOU SHOULDN'T STOP DOING JUST BECAUSE YOU'RE AGING A LITTLE BIT AND CHANGING.

OTHER MOVEMENT CHANGES INCLUDE REDUCED FINE MOTOR CONTROLS, SOMETIMES REFLECTED IN HANDWRITING CHANGES, DIMINISHED REFLEXES, AND LESS ABILITY TO RETAIN BALANCE. YEAH, HANDWRITING'S POORER, BUT I'LL TELL YOU WHAT I DID.

I BECAME A LITERACY VOLUNTEER, AND WHEN YOU ARE DEALING WITH PEOPLE THAT CAN'T READ, YOU REALLY HAVE TO CLEAN UP YOUR HANDWRITING.

SO I WENT BACK TO PRINTING.

I MEAN, I HAD DONE IT SO MUCH THAT I GOT VERY GOOD AT IT.

SO NOW WHEN I WRITE TO MY GRANDCHILDREN, I PRINT EVERYTHING.
I noticed that my sisters -- one's close in age, one's five years younger -- their handwriting has gotten worse.

We used to type our letters.

None of us type anymore.

One has a bad back, one hasn't got a typewriter, and I have arthritis up here, so I don't type much anymore.

You lose, um, sort of control of your writing.

Nervous changes also cause the skin to be less sensitive to pressure and touch, internal pain cues to be reduced, and less efficient ability to adapt to heat and cold. I think older people tend to feel the extremes of temperature more, especially cold.

For some reason, my feet are cold a lot, so I wear wool socks in the winter, and I wear gloves more than I used to, and I put a hat on more than -- I never wore a hat.

So I think you feel the cold more.

I think it's cold that you feel.

As far as heat's concerned, I live in a hot place.

I'm used to it.

I have air conditioning.

I don't go out as much.

The part of the nervous system that people are most interested in is the brain. Although brain cells die and aren't replaced in aging, the brain has many more nerve cells than needed for adequate function. New connections between cells are made to compensate for neurons lost. Therefore, loss of mental ability is not an inevitable
CONSEQUENCE OF AGING. PEOPLE TALK ABOUT CHANGES IN THE NUMBERS OF BRAIN CELLS, BUT SIZE AND NUMBER OF CELLS ALONE DOESN'T MAKE THE DIFFERENCE.

231 01:39:47:18 THE BRAIN, LIKE MANY ORGANS OF THE BODY, HAS ENORMOUS RESERVE.

232 01:39:52:17 EVEN THOUGH ONE LOSES CELLS, THE CELLS THAT REMAIN, IN MANY WAYS, ARE DEVELOPING NEW EXTENSIONS OR PROJECTIONS TO COMMUNICATE WITH OTHER CELLS, SO THERE'S THIS ONGOING COMPENSATORY RESPONSE THAT'S GOING ON.

233 01:40:06:17 ALL OF THE RESEARCH THAT SHOWS THE POSITIVE EFFECT OF ENRICHED ENVIRONMENTS ON THE HEALTH OF THE BRAIN -- THAT'S BEEN VERY, VERY EXCITING.

234 01:40:16:03 PRIOR TO THE 1960s, IT WAS THOUGHT THAT CELLS WERE IMMORTAL AND WOULD CONTINUE TO DIVIDE FOREVER. RESEARCHERS BELIEVED THAT CHANGES OCCURRING OUTSIDE THE CELL CAUSED AGING. VERY LITTLE ATTENTION WAS GIVEN TO CHANGES INSIDE THE CELL. WE ACCIDENTALLY DISCOVERED IN THE EARLY 1960s, AND WORKED ON IN MY LABORATORY, THAT CELLS ARE INDEED MORTAL, THAT NORMAL CELLS GROWN IN LABORATORY GLASSWARE, CONTRARY TO THE BELIEF HELD FOR THE PREVIOUS 60 YEARS, DO INDEED HAVE A FINITE CAPACITY TO DIVIDE AND TO FUNCTION IN CULTURE, AND INDEED, FURTHER, THE AMOUNT OF FUNCTION, OR NUMBERS OF DIVISION EPISODES, IS INVERSELY PROPORTIONAL TO THE AGE OF THE DONOR, WHICH IMMEDIATELY LINKED THIS TO AGING.

235 01:41:15:05 AND NOW VIRTUALLY EVERYONE IN THIS FIELD DOES BELIEVE, SINCE IT'S BEEN SUBSTANTIATED IN LITERALLY HUNDREDS OF LABORATORIES, THAT NORMAL HUMAN AND ANIMAL CELLS ARE MORTAL, AND, THEREFORE, THAT'S WHERE WE SHOULD LOOK FOR THE CAUSES OF AGE CHANGES AND LONGEVITY DETERMINING FACTORS.

236 01:41:37:28 ONE CENTRAL ISSUE IN AGING RESEARCH AS ONE LOOKS AT THE TISSUE LEVEL IS THE QUESTION, WHY DO CELLS SLOW DOWN OR STOP DIVIDING?
AND TO THE EXTENT THAT WE CAN GAIN A BETTER UNDERSTANDING -- AND THE UNDERSTANDING IS MOVING RAPIDLY -- AROUND THE CORNER LIES NEW INSIGHTS ABOUT THE PROBLEM THAT'S JUST THE OPPOSITE, SUCH AS CANCER, WHERE CELLS DIVIDE OUT OF CONTROL.

WHAT THAT ILLUSTRATES IS THAT RESEARCH ON AGING HAS THIS VERY BROAD, VERY LIFE-CYCLE ORIENTED VALUE TO IT.

SO IF WE UNDERSTAND WHAT SLOWS DOWN DIVISION, WE'RE GOING TO, AT THE SAME TIME, HAVE THESE NEW INSIGHTS AS TO DEAL WITH THOSE PROBLEMS WHERE CELLULAR DIVISION OR PROLIFERATION IS GOING RAMPANT AND IS CAUSING ILLNESS.

IT'S REALLY AN INVERSE RELATIONSHIP BETWEEN CANCER AND AGING.

SENESCENT CELLS HAVE A FINITE LIFE SPAN.

TUMOR CELLS ARE IMMORTAL.

AT THE GENETIC LEVEL, THERE IS A LINK.

WE NEED TO FIND OUT WHAT IT IS.

WHAT ROLE DO OUR GENES PLAY IN AGING?

MOLECULAR BIOLOGISTS DESIGNED THE HUMAN GENOME PROJECT, WHICH IS ATTEMPTING TO FIND THE POSITION -- AND EVENTUALLY THE FUNCTION -- OF EVERY GENE ON THE HUMAN CHROMOSOME. WE KNOW THAT IN TIME, WITH THE SUPPORT -- INCLUDING THE FEDERAL GOVERNMENT'S SUPPORT -- OF THE HUMAN GENOME EXPERIMENT -- THE PROJECT TO MAP AND IDENTIFY ALL OF THE GENES THAT WE CARRY IN OUR BODIES, UP TO 100,000 OF THEM -- TO IDENTIFY ALL THESE GENES AND THEIR FUNCTIONS, MOST OF WHICH ARE RELATED TO SOMETHING TO DO WITH OUR HEALTH AND HOW WE AGE OVER TIME.

THAT PROCESS WILL PROBABLY BE COMPLETE WITHIN ANOTHER DECADE.

MOST PEOPLE ASSUME THAT BY 2005, ALL OF THE
GENES THAT WE CARRY WILL HAVE BEEN IDENTIFIED AND MAPPED.

GENETIC ENGINEERING, THE PROCESS OF REPLACING DEFECTIVE GENES WHICH CAUSE DISEASE OR ALTERING THE GENETIC STRUCTURE OF THE ORGANISM IN OTHER WAYS, IS REVEALING INTERESTING RESULTS. ...WHERE ALL OF THE THOUSANDS OF GENES THAT AFFECT OUR PHYSIOLOGY CAN BE UNDERSTOOD, AND WHERE THERE ARE DEFECTS IN THOSE GENES THAT CAUSE DISEASE AND ILLNESS AND DEATH -- THOSE GENES CAN BE, IN THE FUTURE, NOT ONLY DETECTED, BUT ALTERED, AND THEN, IN A SENSE, REPLACED AND CORRECTED IN THE HUMAN BODY TO WARD OFF OR PREVENT VARIOUS KINDS OF DISEASES AND ILLNESS.

[PASSANITI] THERE ARE ONLY A FEW LABORATORIES AT N.I.H.

THAT CAN DO REPLACEMENT GENE THERAPY, AND MANY OF THE REPLACEMENT THERAPIES RIGHT NOW ARE FOR GENETIC DEFICIENCY DISEASES, DISEASES WHERE YOU MAY HAVE AN INABILITY TO HAVE A NORMAL IMMUNE SYSTEM, AND SO IF YOU REPLACE A CERTAIN GENE THAT'S RESPONSIBLE FOR BESTOWING A PERFECTLY FUNCTIONAL IMMUNE SYSTEM, THOSE STUDIES ARE NOW ACCEPTABLY DONE IN HUMANS, AND CLINICAL TRIALS HAVE ALREADY TAKEN PLACE.

ANIMAL MODELS ARE IMPORTANT IN GENETIC RESEARCH. GENETIC ENGINEERING WITH FRUIT FLIES HAS PRODUCED STARTLING RESULTS. IT'S HARD TO STUDY HUMANS BECAUSE THEY LIVE SO LONG.

YOU WANT DATA MUCH SOONER THAN 80 YEARS.

SOME EXCITING THINGS ARE BEING DONE WITH FRUIT FLY RESEARCH.

A RESEARCHER AT THE UNIVERSITY OF CALIFORNIA AT DAVIS HAS FOUND THAT THE LIFE SPAN OF FRUIT FLIES CAN BE EXPANDED BY 200%, 300%, AND CERTAIN GENES HAVE NOW BEEN IDENTIFIED THAT APPARENTLY ARE RESPONSIBLE FOR THIS.

THAT'S A VERY EXCITING AREA, THESE ALTERNATIVE
ANIMAL MODELS.

256  01:45:31:03 SOME OF THESE ARE SIMPLER TO WORK WITH BECAUSE THE GENETICS OF FRUIT FLY HAS BEEN WORKED OUT FOR 20, 30 YEARS NOW.

257  01:45:40:01 THE GENES CAN BE MANIPULATED MUCH EASIER.

258  01:45:43:21 THE CONCEPT OF GENETIC ENGINEERING IS FRIGHTENING TO SOME PEOPLE. HOWEVER, CURING THE ILLNESS OF A LIVING PERSON ISN'T THE SAME AS CREATING A NEW ORGANISM. DR. SPROTT EXPLAINS THE DIFFERENCE BETWEEN CURING AN ILLNESS AT THE BODY CELL, OR SOMATIC, LEVEL AND CREATING A NEW ORGANISM AT THE EGG AND SPERM, OR GERM CELL, LEVEL. A WORRY IS, IF YOU CAN CHANGE CELLULAR FUNCTIONS SO THAT THE ORGANISM LIVES LONGER, YOU CAN ALSO MANIPULATE THAT PROCESS TO PRODUCE THE KIND OF HUMAN BEING WHO IS POLITICALLY ACCEPTABLE.

259  01:46:19:18 THAT'S THE REAL WORRY ABOUT THE WHOLE PROCESS.

260  01:46:22:18 THE KIND OF GENETIC ENGINEERING I'M REFERRING TO FOR AGING PROBLEMS WOULD OCCUR AT THE SOMATIC LEVEL.

261  01:46:29:17 IT WOULD BE CHANGES IN THE WAY CELLS FUNCTION TO MAKE UP FOR SOMETHING LIKE A DEFICIT IN GROWTH HORMONE.

262  01:46:37:18 IT MAY BE THAT THOSE PEOPLE WHO ARE AGING FASTER ARE DOING SO BECAUSE THEIR CELLS RESPONSIBLE FOR PRODUCING GROWTH HORMONE ARE FAILING FASTER THAN OTHER PEOPLE'S.

263  01:46:48:16 WE COULD PERHAPS SUPPLY THEM WITH OTHER CELLS THAT WOULD STIMULATE A GREATER NATURAL RATE OF GROWTH HORMONE PRODUCTION.

264  01:46:56:06 THAT, I THINK, IS A WORTHWHILE ENDEAVOR AND ISN'T IN THE SAME POLITICAL ARENA WITH GENETIC ENGINEERING AT THE GERM CELL LEVEL, WHICH ISN'T WHAT WE'RE TALKING ABOUT IN GERONTOLOGICAL RESEARCH.

265  01:47:09:06 THE GENETICS OF CELL DEATH MAY TEACH US
ABOUT MAXIMUM LIFE SPAN, DISEASE, AND THE DEATH OF INDIVIDUALS. [PASSANITI] THERE ARE A LOT OF INTERESTING BASIC RESEARCH PROBLEMS NOW BEING INVESTIGATED IN TERMS OF CELL DEATH AT THE CELLULAR LEVEL.

266 01:47:25:08 THAT EVENT IS ACTUALLY UNDER CONTROL OF CERTAIN GENES.

267 01:47:28:22 THAT'S THE EXCITING PART OF RESEARCH ON CELL DEATH.

268 01:47:32:09 IT'S A BIG JUMP TO GO FROM THERE TO ORGANISMIC DEATH, OF COURSE, BUT SOME OF THOSE SAME MECHANISMS WILL BE IMPORTANT BECAUSE ORGANISMS DIE PROBABLY BECAUSE THEY CAN'T REGENERATE TISSUE OR ORGANS IN THEIR BODY.

269 01:47:47:25 BUT HOW LONG DO WE REALLY WANT TO LIVE? MOLLIE PIER NOTES THAT CONCEPTS OF LONGEVITY HAVE CHANGED OVER TIME. MY GRANDMOTHER DIED BEFORE MY GRANDFATHER DID.

270 01:47:59:03 SHE WAS 53.

271 01:48:00:20 I REMEMBER AT HER FUNERAL PEOPLE SAYING, "WELL, SHE LIVED A LONG LIFE." THE CONTRAST BETWEEN THEN AND NOW IS MIND-BOGGLING BECAUSE NOW AT 53, A WOMAN IS JUST STARTING OUT.

272 01:48:14:16 THEY'RE EITHER GOING THROUGH DIVORCE, OR THEIR CHILDREN HAVE GROWN, AND THEY'RE LOOKING FOR NEW CAREERS OR DOING THINGS THAT JUST ARE ENTIRELY NEW.

273 01:48:24:03 AT THAT TIME, 53 WAS CONSIDERED A FAIRLY Ripe OLD AGE.

274 01:48:28:17 I WANT TO SEE THE NEW CENTURY IN, AND I WANT TO SEE WHAT DEVELOPMENTS WILL HAVE BEEN BY THAT TIME IN AREAS OF TRAVEL, TRAVEL IN SPACE, WHICH I EXPECT WILL BE PART OF OUR LIVES BEFORE 2000.

275 01:48:45:17 AND I WOULD SAY THAT IF MY VARIOUS SENSORY ORGANS ARE PERFORMING, I WOULDN'T CARE HOW LONG I WOULD LIVE.
NOW IF ALL THESE FUNCTIONS HAVE DISAPPEARED -- CAN'T SEE, CAN'T HEAR, CAN'T MOVE, CAN'T TASTE -- THEN I'D HAVE TO MAKE A NEW DECISION ABOUT THE AGE OF, OH, PERHAPS, UH...2010, SO THAT I'D BE AT LEAST 100 YEARS OLD.

ALTHOUGH WE LIVE LONGER TODAY, LENGTH OF LIFE IS NOT THE ONLY QUALITY WE DESIRE. MOST OF US WOULD PROBABLY, ONCE WE'D MATURE, TRADE KNOWING WE COULD LIVE TILL OUR 85th BIRTHDAY, HAVE A STEAK, A GLASS OF WINE, ONE LAST CIGAR THAT YOU HAVEN'T BEEN ABLE TO HAVE FOR 40 YEARS, AND CHECK OUT THAT NIGHT PEACEFULLY IN YOUR SLEEP FOR BEING 120 AND HAVING THE RISKS THAT GO WITH BEING 120.

WHAT MOST OF US ARE AFRAID OF IS AN EXTENDED PERIOD OF DISABILITY SPENT DEPENDENT ON OTHER PEOPLE, EITHER LIVING WITH OUR FAMILY OR IN A LONG-TERM CARE INSTITUTION.

MOST OF US WOULD TRADE A SHORTER LIFE SPAN FOR HIGHER QUALITY IN THE LAST PART OF IT.

INSTEAD OF THE FOUNTAIN OF YOUTH, I THINK WE COULD SUBSTITUTE THE FACT THAT IF WE COULD ALL LIVE A HEALTHY LIFE UNTIL THE LAST DAY, THEN BOOM, YOU'RE DEAD, THAT WOULD BE IDEAL.

SO I THINK, UH, THE HEALTH PEOPLE NOW AND THE GOVERNMENT IS OPENING ITS EYES AND EARS TO THE FACT THAT...

WHAT THEY WANT TO DO IS NOT NECESSARILY EXTEND LIFE, BECAUSE THERE'S A LIMIT, BUT THEY WANT TO MAKE THE QUALITY OF LIFE BETTER FOR A LONGER PERIOD SO THAT THE PERIOD OF FINAL ILLNESS WILL BE SHORTER AND SHORTER.

CAN WE PRODUCE THE 150-, 200-, 300-, 350-YEAR-OLD MAN?

UM, THAT'S AN INTERESTING QUESTION, AND THERE ARE SOME NUMBER OF BIOLOGISTS WHO THINK THAT THERE ARE A SMALL NUMBER OF RELATIVELY SIMPLE BIOLOGICAL PROCESSES, GENETICALLY CONTROLLED, WHICH COULD BE MANIPULATED TO PRODUCE SUCH A CONSEQUENCE.
One of the major questions for us at this institute is how to separate legitimate research to understand basic aging processes from what I might call nut fringe research aimed at producing dramatic increases in life span.

If we understand basic processes, what we would really like to do is improve the quality of the terminal third, would increase what I would call health span.

If we understand how basic aging processes at the biological level work, we may be able to have a big impact on those deleterious changes that characterize aging as we currently know it.

There is a lot of research going on at the Gerontology Center at USC, as well as at other gerontology centers throughout the world on diseases of the aging.

A lot of research is being done in Alzheimer's, in Parkinson's disease, in strokes, and as time goes on, we're finding more and more things that are keeping people alive, but we want not just to keep people alive.

We want them to have a good quality of life.

Questions about the outcome of biological research are hotly debated in the public arena. It's a raging public debate about what we've done so far.

There are strong proponents of the notion that what we've done with our research so far is to increase, not decrease, human misery by increasing that period of dependency by keeping people alive.

You see that debate played out in the press with questions about whether one should be allowed to commit suicide when you get to a certain point of dependency, with questions about whether we should ration health care, access to kidney dialysis machines or heart
TRANSPLANTS ONCE YOU REACH A CERTAIN AGE.

IT'S A VERY INTERESTING, DIFFICULT, POLICY KIND OF QUESTION PLAYED OUT AT A VERY PERSONAL LEVEL.

IT'S INVOLVED BASICALLY IN OUR ASSUMPTIONS ABOUT WHAT BIOLOGICAL RESEARCH IS GOING TO BE ABLE TO PRODUCE FOR US.

IN THE FUTURE, I DON'T BELIEVE THAT 65 WILL BE CONSIDERED SENIOR CITIZENSHIP ANYMORE.

IT WILL PROBABLY BE RAISED TO MAYBE 75 OR EVEN 80.

IT WILL NOT BE UNUSUAL TO HEAR OF PEOPLE LIVING WELL AND PRODUCTIVELY INTO THEIR 100s.

TODAY WE ACCEPT PEOPLE IN THEIR 80s AS A NORMAL PART OF LIFE.

IN FUTURE GENERATIONS, PEOPLE WILL BE LIVING TO BE 110 AND 115, AND HOPEFULLY, WHATEVER RESEARCH IS GOING ON NOW WILL NOT JUST PROLONG THEIR LIVES, BUT GIVE A VERY, VERY GOOD QUALITY TO THEIR LIFE STYLES.

ONE OF THE ORGANIZING CONCEPTS IN TERMS OF WHERE RESEARCH IS MOVING RIGHT NOW AND TO THE FUTURE ACTUALLY RELATES TO A MYTH IN GREEK MYTHOLOGY THAT GOES BACK 25 CENTURIES, AND THAT WAS THE MYTH OF TITHONUS.

TITHONUS WAS A MORTAL WHO FELL IN LOVE WITH THE GODDESS EOS.

EOS WAS THE GODDESS OF DAWN.

SHE WENT TO ALMIGHTY ZEUS TO PLEAD FOR IMMORTALITY FOR HER LOVER BECAUSE SHE WANTED HIM TO LIVE FOREVER.

SHE WENT WITH SOME HESITATION BECAUSE OF ZEUS BEING RATHER UNPREDICTABLE.

TO HER SURPRISE, HE GRANTED HER WISH, BUT LATER, EOS REALIZED THAT WHILE ZEUS GAVE TITHONUS IMMORTALITY, HE FAILED TO GIVE HIM
ETERNAL YOUTH.

307  01:54:52:03  TITHONUS PROCEEDS TO GROW OLDER AND MORE FRAIL.

308  01:54:55:02  THAT CONCEPT 25 CENTURIES OLD CAPTURES WHAT HAS BECOME A GROWING CONCERN IN THE LAST 25 YEARS OF THE 20th CENTURY.

309  01:55:03:17  THAT'S THE IMPORTANCE OF RESEARCH ON THE QUALITY OF LIFE KEEPING PACE WITH RESEARCH ON THE QUANTITY OF LIFE.

310  01:55:10:18  THE REAL AIM OF AGING RESEARCH TODAY IS ENHANCING THE QUALITY OF THOSE LATER YEARS.

311  01:55:31:21  CAPTIONING PERFORMED BY THE NATIONAL CAPTIONING INSTITUTE, INC.

312  01:55:35:15  THE REAL AIM OF AGING RESEARCH TODAY IS ENHANCING THE QUALITY OF THOSE LATER YEARS.

313  01:55:38:00  CAPTIONING PERFORMED BY THE NATIONAL CAPTIONING INSTITUTE, INC.

314  01:56:14:01  CAPTIONS COPYRIGHT 1993 UNIVERSITY OF HAWAII AT MANOA CENTER ON AGING

315  01:56:22:26  Annenberg Media

316  01:56:26:10  §