

--> Display at 01:00:00:06

--> Display at 01:00:06:11
*FUNDING FOR THIS PROGRAM
IS PROVIDED BY ANNENBERG/CPB*

--> Display at 01:00:10:12
--> Erase at 01:00:12:18
TO ADVANCE EXCELLENT TEACHING.

--> Display at 01:00:27:00
IN THE VAST EMPTINESS OF SPACE,

--> Display at 01:00:29:20
WHERE THE TEMPERATURE
ON DIFFERENT PLANETS' SURFACES

--> Display at 01:00:33:08
CAN VARY FROM 465°C TO -220°C,

--> Display at 01:00:39:29
--> Erase at 01:00:44:10
THERE IS A SMALL OASIS
WHERE LIFE FLOURISHES.

--> Display at 01:00:49:08
WITH EVERY PASSING DAY,
NEW SPECIES ARE REVEALED.

--> Display at 01:00:53:23
IN OUR QUEST
TO UNCOVER NEW LIFE,

--> Display at 01:00:56:13
--> Erase at 01:00:58:24
WHERE CAN WE LOOK?

--> Display at 01:01:12:04
AT NEAR BOILING,

--> Display at 01:01:13:20
CAN LIFE EXIST
IN THESE SULFUR HOT SPRINGS?

--> Display at 01:01:17:25
AT -90°C,

--> Display at 01:01:20:16
IS THERE LIFE
IN THE ANTARCTIC ICE FLOES?

--> Display at 01:01:24:22
IN THE CORE
OF THIS NUCLEAR REACTOR,

--> Display at 01:01:27:15
CAN WE FIND LIFE?

--> Display at 01:01:29:29
AND ON MARS,
WHERE THERE IS NO OXYGEN

--> Display at 01:01:33:09
AND THE WATER THAT EXISTS
IS FROZEN IN THE GROUND,

--> Display at 01:01:36:10
CAN WE FIND LIFE?

--> Display at 01:01:39:15
IF SOMETHING NEVER LIVING
CAN APPEAR ALIVE

--> Display at 01:01:42:23
AND SOMETHING LIVING
CAN APPEAR DEAD,

--> Display at 01:01:45:11
WHAT DO WE LOOK FOR?

--> Display at 01:01:48:19
--> Erase at 01:01:51:13
IT COMES DOWN
TO THE BASIC QUESTION...

--> Display at 01:02:14:26
WELCOME,
I'M LINDA GRISHAM,

--> Display at 01:02:17:20
A BIOCHEMIST
AND NOW A SCIENCE EDUCATOR

--> Display at 01:02:19:28
AT LESLEY UNIVERSITY
IN CAMBRIDGE, MASSACHUSETTS.

--> Display at 01:02:23:12
AND I'M DOUGLAS ZOOK,
A BIOLOGIST

--> Display at 01:02:25:04
AND SCIENCE EDUCATOR
AT BOSTON UNIVERSITY.

--> Display at 01:02:28:00
LINDA AND I WILL BE WITH YOU THROUGHOUT THIS COURSE --

--> Display at 01:02:30:27
DESIGNED FOR TEACHERS
OF STUDENTS

--> Display at 01:02:32:26
IN KINDERGARTEN
THROUGH THE SIXTH GRADE.

--> Display at 01:02:35:12
THE PURPOSE OF THIS COURSE
IS TO ENHANCE AND STRENGTHEN

--> Display at 01:02:38:20
YOUR UNDERSTANDING
OF LIFE SCIENCE CONCEPTS

--> Display at 01:02:41:20
THAT ARE LIKELY TO BE PART

--> Display at 01:02:43:04
OF AN ELEMENTARY SCHOOL
SCIENCE CURRICULUM.

--> Display at 01:02:45:19
IN THESE SESSIONS,
WE WILL FOCUS UPON

--> Display at 01:02:48:10
HOW SCIENTISTS DEFINE LIFE
AND CLASSIFY LIVING THINGS,

--> Display at 01:02:52:06
THE LIFE STAGES AND LIFE CYCLES OF ANIMALS AND PLANTS,

--> Display at 01:02:56:04
THE BASICS
OF BIOLOGICAL EVOLUTION

--> Display at 01:02:59:06
AND HOW LIFE FORMS
DEPEND UPON EACH OTHER.

--> Display at 01:03:02:23
OUR GOAL
IS TO CONNECT THE SCIENCE

--> Display at 01:03:04:17
UNDERLYING THESE TOPICS

--> Display at 01:03:06:12
WITH THE CHALLENGES
THAT WE ALL FACE

--> Display at 01:03:08:09
WHEN EXPLORING LIFE SCIENCE
WITH OUR STUDENTS.

--> Display at 01:03:11:05
IN THIS SESSION

WE FOCUS ON THE QUESTION,

--> Display at 01:03:14:09
WHAT IS LIFE?

--> Display at 01:03:15:24
WHAT IS LIFE
IS A VERY IMPORTANT TOPIC

--> Display at 01:03:18:15
--> Erase at 01:03:21:15
TO YOUNG CHILDREN,
ON MANY LEVELS.

--> Display at 01:03:29:13
IN THE EARLY GRADES,
WE ARE VERY INTERESTED

--> Display at 01:03:32:12
IN THE STUDENTS
BEGINNING TO HAVE WAYS

--> Display at 01:03:35:05
OF CATEGORIZING THE WORLD
THAT THEY OBSERVE.

--> Display at 01:03:38:23
Woman: WHY?

--> Display at 01:03:40:29
BECAUSE THE PLANTS ARE ALL CRUNCHY AND BROWN.

--> Display at 01:03:45:08
Thier: AND SO WHAT WE START WITH

--> Display at 01:03:47:10
IS TO INVENT
THREE CATEGORIZATIONS --

--> Display at 01:03:50:21
LIVING, DEAD, AND NEVER LIVING.

--> Display at 01:03:53:25
DOES IT BELONG IN LIVING, NONLIVING, OR DEAD?

--> Display at 01:03:57:03
Thier: FOR THE FIRST TIME
WE ARE INTRODUCING

--> Display at 01:03:59:04
THE CONCEPTUAL STRUCTURE
OF LIFE SCIENCE.

--> Display at 01:04:04:11
WE HAVE ORGANISMS.

--> Display at 01:04:06:03
ORGANISMS HAVE LIFE CYCLES,

--> Display at 01:04:08:12
WHICH LEAD TO POPULATIONS.

--> Display at 01:04:11:14
THESE POPULATIONS
SET UP COMMUNITIES.

--> Display at 01:04:14:18
AND THOSE COMMUNITIES
AND THE ENVIRONMENT THEY LIVE IN

--> Display at 01:04:17:16
FORM ECOSYSTEMS.

--> Display at 01:04:21:00
AND SO, WHAT IS ALIVE

--> Display at 01:04:22:12
IS A VERY IMPORTANT CATEGORIZATION

--> Display at 01:04:24:23
TO HELP YOU UNDERSTAND
AND EXPLAIN

--> Display at 01:04:27:08
THE WORLD YOU LIVE IN.

--> Display at 01:04:28:28
SO YOU'RE GOING
TO WRITE --

--> Display at 01:04:31:00
YOU COULD WRITE
"FAKE ROSE."

--> Display at 01:04:33:02
GOOD, "FAKE ROSE," GOOD.

--> Display at 01:04:35:07
Thier: STUDENTS COME TO CLASS

--> Display at 01:04:37:04
WITH AN UNDERSTANDING
THAT THEY ALREADY HAVE.

--> Display at 01:04:41:11
AND NOW WE WANT TO USE THAT

--> Display at 01:04:45:20
TO BUILD A MORE "SCIENTIFIC"
UNDERSTANDING OF LIFE.

--> Display at 01:04:52:08

AND THAT'S WHAT WE'RE TRYING
TO HELP THE STUDENTS BUILD

--> Display at 01:04:55:07
SO THAT THEY SEE THAT THERE IS AN ORDER TO THE UNIVERSE,

--> Display at 01:04:58:27
ON THEIR LEVEL.

--> Display at 01:05:00:24
DR. THIER REPRESENTS

--> Display at 01:05:02:15
THE SCIENCE CURRICULUM IMPROVEMENT STUDY

--> Display at 01:05:04:24
ALSO KNOWN AS "SCIS".

--> Display at 01:05:07:03
IN THESE PROGRAMS
WE WILL FEATURE

--> Display at 01:05:08:27
A VARIETY
OF CURRICULUM RESOURCES

--> Display at 01:05:11:00
TO ILLUSTRATE
HOW LIFE SCIENCE CONCEPTS

--> Display at 01:05:13:13
ARE ADDRESSED
IN TYPICAL CLASSROOMS.

--> Display at 01:05:16:07
GOOD QUALITY TEACHING FLOWS FROM QUALITY CURRICULUM MATERIALS

--> Display at 01:05:20:00
THAT ARE BASED UPON RESEARCH

--> Display at 01:05:22:02
AND CO-DEVELOPED WITH TEACHERS
IN REAL CLASSROOMS.

--> Display at 01:05:25:13
SCIS IS AN EXAMPLE OF THIS TYPE
OF CURRICULUM RESOURCE.

--> Display at 01:05:29:08
SO IF YOU WANT TO KNOW
MORE OUT MORE ABOUT SCIS,

--> Display at 01:05:31:19
PLEASE VISIT
OUR WEB SITE.

--> Display at 01:05:34:08
THIS ICON WILL ALERT YOU
THAT ADDITIONAL INFORMATION

--> Display at 01:05:38:00
IS AVAILABLE
ON OUR WEB SITE.

--> Display at 01:05:41:12
DR. THIER MADE
AN IMPORTANT OBSERVATION --

--> Display at 01:05:44:14
CHILDREN CLEARLY
COME INTO THE CLASSROOM

--> Display at 01:05:46:27
WITH THEIR OWN IDEAS.

--> Display at 01:05:48:20
IT'S IMPORTANT TO US,
AS TEACHERS,

--> Display at 01:05:51:14
TO HAVE SOME UNDERSTANDING
OF THESE PRIOR CONCEPTS

--> Display at 01:05:54:08
IF WE ARE TO BUILD UPON
OR CHANGE THEM.

--> Display at 01:05:57:20
OVER THE YEARS MANY RESEARCHERS
HAVE CONDUCTED STUDIES

--> Display at 01:06:01:18
THAT UNCOVER CHILDREN'S IDEAS ABOUT SCIENCE CONCEPTS.

--> Display at 01:06:05:18
WE WILL HIGHLIGHT
SOME OF THESE RESEARCH FINDINGS

--> Display at 01:06:08:01
IN OUR SESSIONS.

--> Display at 01:06:10:08
ONE FINDING HAS TO DO
WITH YOUNG CHILDREN'S IDEAS

--> Display at 01:06:13:14
ABOUT LIFE AND MOVEMENT.

--> Display at 01:06:15:13
AS ADULTS WE KNOW MANY OBJECTS
THAT MOVE AREN'T ALIVE,

--> Display at 01:06:19:18
SUCH AS A CAR, A FLAG, CLOUDS,

--> Display at 01:06:23:09
OR EVEN WATER FLOWING.

--> Display at 01:06:25:29
WE ALSO KNOW THAT SOME OBJECTS THAT ARE ALIVE

--> Display at 01:06:28:29
DON'T MOVE ON THEIR OWN.

--> Display at 01:06:31:02
--> Erase at 01:06:34:08
MANY CHILDREN, HOWEVER,
DON'T REALIZE THIS.

--> Display at 01:06:37:15
ACCORDING TO RESEARCH
CARRIED OUT BY

--> Display at 01:06:39:10
DR. ROSALIND DRIVER
IN THE UNITED KINGDOM,

--> Display at 01:06:42:15
CHILDREN UP TO GRADE TWO

--> Display at 01:06:44:19
THINK THAT EVERYTHING
THAT MOVES IS ALIVE.

--> Display at 01:06:47:24
WHAT DO YOU THINK?

--> Display at 01:06:49:17
--> Erase at 01:06:53:13
IS MOVEMENT ALWAYS
A CHARACTERISTIC OF LIFE?

--> Display at 01:06:56:07
CHILDREN'S IDEAS CAN BE SIMILAR
TO THOSE HELD BY ADULTS.

--> Display at 01:07:00:04
AS YOU LOOK AT
FINDINGS LIKE THIS,

--> Display at 01:07:02:04
THINK ABOUT
HOW THESE IDEAS COMPARE

--> Display at 01:07:04:03
TO YOUR STUDENTS' IDEAS
AND TO YOUR OWN.

--> Display at 01:07:07:15
LISTENING TO
CHILDREN'S IDEAS

--> Display at 01:07:10:02
IS A POWERFUL WAY
TO INFORM OUR TEACHING.

--> Display at 01:07:13:16
AS WE LATER EXPLORE
LIFE SCIENCE CONCEPTS,

--> Display at 01:07:16:24
OUR GOAL IS TO ENABLE
YOU TO DETERMINE

--> Display at 01:07:19:15
WHICH OF THESE IDEAS
ARE SCIENTIFICALLY ACCURATE

--> Display at 01:07:22:01
AND WHICH AREN'T.

--> Display at 01:07:23:26
WE RECRUITED SEVERAL CHILDREN
TO WORK WITH US

--> Display at 01:07:27:02
IN OUR
SCIENCE STUDIO.

--> Display at 01:07:29:01
IN THE SCIENCE STUDIO,

--> Display at 01:07:30:10
WE WILL UNCOVER
THE CHILDREN'S IDEAS

--> Display at 01:07:32:16
AS THEY ENGAGE
IN CAREFULLY DESIGNED ACTIVITIES

--> Display at 01:07:35:18
ADAPTED FROM THE CURRICULUM RESOURCES WE'VE CHOSEN.

--> Display at 01:07:39:08
ELEANOR ABRAMS,
A BIOLOGIST AND SCIENCE EDUCATOR

--> Display at 01:07:44:07
AT THE UNIVERSITY
OF NEW HAMPSHIRE

--> Display at 01:07:46:13
--> Erase at 01:07:50:04
WILL FACILITATE ACTIVITIES

IN THE SCIENCE STUDIO.

--> Display at 01:08:02:22
TODAY THE CHILDREN WILL START
BY VIEWING THREE OBJECTS --

--> Display at 01:08:05:21
LIVING, DEAD, AND NONLIVING.

--> Display at 01:08:07:29
THEY WILL LIST
THE CHARACTERISTICS

--> Display at 01:08:09:13
THEY FEEL
DEFINE THOSE CATEGORIES.

--> Display at 01:08:12:08
YOU'RE GOING TO BE GIVEN SOME OBJECTS TO LOOK AT VERY CLOSELY.

--> Display at 01:08:16:08
AND WHAT I WANT YOU TO DO,
IS WITH YOUR PARTNER,

--> Display at 01:08:18:25
THINK ABOUT SOME GOOD WORDS THAT WOULD DESCRIBE THAT OBJECT.

--> Display at 01:08:23:16
--> Erase at 01:08:25:29
AND THEY'RE COMING AROUND NOW.

--> Display at 01:08:34:10
COOL, CAN I PICK IT UP?

--> Display at 01:08:35:28
Abrams:
OKAY, NOW WORK WITH YOUR PARTNER

--> Display at 01:08:37:17
--> Erase at 01:08:39:24
AND THINK ABOUT SOME GOOD WORDS TO DESCRIBE IT.

--> Display at 01:08:42:19
OH, YEAH, BECAUSE HE'S,
LIKE, SHAKING.

--> Display at 01:08:45:13
SEE RIGHT THERE?
YEAH.

--> Display at 01:08:47:14
MAYBE HE'S BREATHING.

--> Display at 01:08:52:12
SO TELL ME, WHAT DO YOU THINK MAKES SOMETHING ALIVE?

--> Display at 01:08:55:03
THEY CAN BREATHE,
THEY CAN HEAR,

--> Display at 01:08:58:06
THEY CAN EAT,
AND THEY CAN SMELL.

--> Display at 01:09:01:09
SO DO ALL
LIVING THINGS HEAR?

--> Display at 01:09:06:07
YEAH.

--> Display at 01:09:07:27
THEY ALL SMELL.

--> Display at 01:09:09:24
ALL LIVING THINGS SMELL?

--> Display at 01:09:11:09
SO WOULD YOU DESCRIBE THIS
AS BEING ALIVE?

--> Display at 01:09:13:24
YES.

--> Display at 01:09:15:18
YES?

--> Display at 01:09:17:19
SO IS IT LIVING?

--> Display at 01:09:19:03
YES, OF COURSE
THE MOUSE IS LIVING.

--> Display at 01:09:25:08
OKAY, NOW I'M GOING TO
BRING OUT A SECOND OBJECT.

--> Display at 01:09:28:20
AND WE WANT YOU TO LOOK
AT THIS VERY CLOSELY,

--> Display at 01:09:31:04
AS CLOSELY AS
YOU DID THE MICE,

--> Display at 01:09:33:05
AND TRY TO DESCRIBE IT.

--> Display at 01:09:35:17
--> Erase at 01:09:38:01
SO WORK IN PAIRS

AND TRY TO DESCRIBE IT.

--> Display at 01:09:42:19
IT'S DEAD.

--> Display at 01:09:44:12
IS IT?

--> Display at 01:09:45:27
IT'S NOT MOVING.

--> Display at 01:09:51:15
I CAN'T LOOK AT IT.

--> Display at 01:09:53:10
IT'S NOT MOVING.

--> Display at 01:09:54:28
Abrams:
IT'S NOT MOVING.

--> Display at 01:09:57:07
IT'S NOT BREATHING.

--> Display at 01:09:59:06
HOW DO YOU KNOW?

--> Display at 01:10:01:03
IT'S DEAD.

--> Display at 01:10:02:20
IT'S NOT BREATHING.

--> Display at 01:10:04:10
YOU HAVE TO BE ALIVE
TO BREATHE.

--> Display at 01:10:06:11
WELL, HOW DO YOU KNOW
IT'S DEAD?

--> Display at 01:10:08:08
IT WOULD BE JUMPING AROUND
AND IT WOULD BE MAKING A SOUND

--> Display at 01:10:10:28
AND IT WOULD BE MOVING,
AND IT'S NOT MOVING.

--> Display at 01:10:13:12
AND WHAT DOES
IT FEEL LIKE?

--> Display at 01:10:15:23
UH, I DON'T WANT
TO FEEL IT.

--> Display at 01:10:18:29
IT'S HUGE.

--> Display at 01:10:21:10
I LIKE TO FEEL ALIVE ONES,
BUT NOT DEAD ONES.

--> Display at 01:10:25:17
WHY?

--> Display at 01:10:27:06
I DON'T KNOW.

--> Display at 01:10:29:15
IT DOESN'T FEEL ANYTHING LIKE
I THOUGHT IT WAS GOING TO FEEL.

--> Display at 01:10:31:24
WHAT DOES IT FEEL LIKE?

--> Display at 01:10:33:09
HERE, TOUCH IT.
WHAT'S IT
FEEL LIKE?

--> Display at 01:10:35:22
IT FEELS KIND OF LIKE THE MOUSE.

--> Display at 01:10:37:20
YEAH.

--> Display at 01:10:39:12
ESPECIALLY THE WINGS.

--> Display at 01:10:41:06
OKAY, JUST WRITE.

--> Display at 01:10:42:13
IT'S SOFTER THAN
I THOUGHT IT WOULD BE.

--> Display at 01:10:44:11
DRIED UP, THOUGH,
DRIED UP.

--> Display at 01:10:47:04
TOUCH IT FOR ONCE.
NO, PLEASE.

--> Display at 01:10:49:26
SO WE'RE TALKING ABOUT THINGS THAT ARE LIVING,

--> Display at 01:10:52:14
THAT ARE DEAD,
AND THINGS THAT CANNOT --

--> Display at 01:10:55:18
THAT NEVER ACTUALLY LIVED.

--> Display at 01:10:58:14
LIKE CARS, THEY NEVER
ACTUALLY LIVED.

--> Display at 01:11:01:00
THIS CAMERA IS NOT
A LIVING THING.

--> Display at 01:11:03:24
A COMPUTER IS
SORT OF LIVING, THOUGH.

--> Display at 01:11:05:28
DO YOU KNOW WHY?

--> Display at 01:11:07:14
Abrams: NO, WHY?
IT THINKS.

--> Display at 01:11:09:15
Toby: YEAH, BUT THAT DOESN'T MEAN IT HAS A BRAIN

--> Display at 01:11:11:06
AND IT DOESN'T MEAN IT HEARS.

--> Display at 01:11:13:21
YEAH, BUT IT
ACTUALLY THINKS.

--> Display at 01:11:16:03
Abrams: OKAY, I'M GOING TO BRING EVERYBODY BACK TOGETHER NOW.

--> Display at 01:11:18:20
WHAT DID YOU NOTICE
ABOUT YOUR CRICKETS?

--> Display at 01:11:20:04
Leo: DEAD.
Toby: IT'S DEAD.

--> Display at 01:11:22:02
Abrams: DEAD.

--> Display at 01:11:24:09
NOW, LOOK AT THIS ONE
VERY CLOSELY AND DESCRIBE IT.

--> Display at 01:11:27:29
DOES THIS MOVE --
NO, DON'T TOUCH IT.

--> Display at 01:11:30:02

BUT IT ONLY MOVES
IF YOU MAKE IT MOVE,

--> Display at 01:11:32:01
LIKE THIS OR SOMETHING.

--> Display at 01:11:34:02
YEAH, BUT IT
DOESN'T MOVE.
BY ITSELF.

--> Display at 01:11:36:10
--> Erase at 01:11:40:09
BUT JUST SAY IT
DOESN'T KNOW ANYTHING.

--> Display at 01:11:43:28
Abrams: SO IF IT'S NOT DEAD,
AND IF IT'S NOT ALIVE,

--> Display at 01:11:46:26
WHAT IS IT?

--> Display at 01:11:49:16
--> Erase at 01:11:51:07
IT'S...

--> Display at 01:11:57:00
IT'S NOTHING.

--> Display at 01:11:58:21
IT'S NOTHING.

--> Display at 01:12:00:08
UM, IT MEANS
IT'S NOT ALIVE.

--> Display at 01:12:02:07
AND IT DOESN'T MEAN
IT'S DEAD OR ANYTHING

--> Display at 01:12:04:24
BUT IT DOESN'T HAVE A BRAIN,
IT CAN'T THINK.

--> Display at 01:12:09:10
IT DOESN'T EVEN BREATHE.

--> Display at 01:12:11:23
IT DOESN'T HAVE LUNGS,
IT DOESN'T EAT

--> Display at 01:12:14:27
IT DOESN'T DRINK,
IT DOESN'T MOVE.

--> Display at 01:12:16:21
AND IT NEVER DID.
AND IT NEVER WILL.

--> Display at 01:12:19:21
--> Erase at 01:12:21:27
IT NEVER DID
AND IT NEVER WILL.

--> Display at 01:12:24:00
THESE CHILDREN DO HAVE
LOTS OF IDEAS

--> Display at 01:12:27:05
ABOUT WHAT MAKES
SOMETHING LIVING,

--> Display at 01:12:29:00
EVEN THOUGH
SOME OF THEIR IDEAS

--> Display at 01:12:30:24
DO NOT APPLY
TO ALL LIVING THINGS.

--> Display at 01:12:33:20
CHARACTERISTICS LIKE HEARING, BREATHING, THINKING...

--> Display at 01:12:37:03
OR MOVING.

--> Display at 01:12:39:15
THEY'RE ON THE RIGHT TRACK
BY MAKING LISTS.

--> Display at 01:12:42:15
LIFE CAN'T BE DEFINED
BY A SINGLE CHARACTERISTIC.

--> Display at 01:12:45:20
ONE CHARACTERISTIC
OF LIFE

--> Display at 01:12:47:13
FOLLOWS FROM STUDENTS' IDEAS ABOUT HOW LIFE IS ORGANIZED.

--> Display at 01:12:51:20
THE CHILDREN GAVE
SOME INSIGHT INTO THIS.

--> Display at 01:12:55:23
THEY PROBABLY
DEFINITELY HAVE A HEART.

--> Display at 01:12:57:24
AND A BRAIN.

--> Display at 01:12:59:24
YEAH, AND BONES.

--> Display at 01:13:02:09
LUNGS.

--> Display at 01:13:04:09
Leo: AND THERE'S SOME
SORT OF GILL RIGHT HERE.

--> Display at 01:13:08:05
THIS IS A FISH?

--> Display at 01:13:11:13
I THINK ITS STOMACH
IS RIGHT HERE.

--> Display at 01:13:13:15
AND THE LIVER IS RIGHT HERE.

--> Display at 01:13:17:13
AND MAYBE THE INTESTINES
WILL GO RIGHT HERE.

--> Display at 01:13:22:16
Abrams: ARE LIVING THINGS
BUILT FROM ANYTHING?

--> Display at 01:13:25:05
A HUMAN HAS PARTS.

--> Display at 01:13:27:25
EVERY LIVING THING
HAS PARTS.

--> Display at 01:13:31:22
Grisham: IN THEIR FISH DRAWING,

--> Display at 01:13:33:13
LEO AND TOBY
DESCRIBE LIVINGS THINGS

--> Display at 01:13:35:21
AS BEING MADE OF PARTS,
THOUGH THEIR UNDERSTANDING

--> Display at 01:13:38:10
SEEMS LIMITED TO LARGER PARTS,
LIKE A STOMACH.

--> Display at 01:13:42:16
THEY ALSO RECOGNIZE
THAT THE LIVING WORLD

--> Display at 01:13:44:18

IS DIFFERENT FROM
THE NONLIVING WORLD

--> Display at 01:13:46:10
IN THIS REGARD,

--> Display at 01:13:47:22
EVEN THOUGH OBJECTS, LIKE CARS,
ARE ALSO MADE OF PARTS.

--> Display at 01:13:51:26
LIFE FORMS
ARE HIGHLY ORGANIZED.

--> Display at 01:13:54:29
BUT HOW?

--> Display at 01:13:56:14
THIS BRINGS US
TO A CHARACTERISTIC

--> Display at 01:13:58:09
--> Erase at 01:14:01:16
THAT ALL LIFE FORMS
HAVE IN COMMON.

--> Display at 01:14:12:09
A MOUSE IS AN EXAMPLE
OF AN ORGANISM --

--> Display at 01:14:14:28
AN INDIVIDUAL LIVING THING.

--> Display at 01:14:17:22
THE MOUSE HAS SKIN AND FUR,

--> Display at 01:14:20:15
EYES AND EARS,

--> Display at 01:14:22:17
AND INTERNALLY,
A WINDPIPE AND LUNGS,

--> Display at 01:14:25:22
A HEART AND BLOOD VESSELS,

--> Display at 01:14:27:24
A STOMACH AND INTESTINE.

--> Display at 01:14:30:15
IN THIS WAY,
THE BODY OF THE MOUSE

--> Display at 01:14:33:11
IS ORGANIZED INTO ORGAN SYSTEMS MADE UP OF ORGANS.

--> Display at 01:14:37:21
THE STOMACH IS AN ORGAN
WITHIN THE DIGESTIVE SYSTEM.

--> Display at 01:14:42:22
THE ORGANS THEMSELVES ARE
MADE UP OF DIFFERENT TISSUES.

--> Display at 01:14:46:27
THE MOUSE'S STOMACH IS MADE UP

--> Display at 01:14:48:28
OF SEVERAL DIFFERENT
TISSUE LAYERS.

--> Display at 01:14:51:25
--> Erase at 01:14:54:14
BUT WHAT ARE TISSUES MADE OF?

--> Display at 01:14:57:05
THEY'RE MADE OF CELLS.

--> Display at 01:14:59:15
CELLS ARE THE SINGLE SUB-UNITS

--> Display at 01:15:01:22
--> Erase at 01:15:05:21
THAT ACT AS THE BUILDING BLOCKS
OF ALL LIVING THINGS.

--> Display at 01:15:12:07
CELLS COME IN AN AMAZING VARIETY
OF SHAPES AND SIZES

--> Display at 01:15:16:00
--> Erase at 01:15:19:08
AND FUNCTION TO MEET THE NEEDS
OF THE WHOLE ORGANISM.

--> Display at 01:15:21:29
DIFFERENT GROUPS OF ORGANISMS
CAN EVEN BE TOLD APART

--> Display at 01:15:24:29
--> Erase at 01:15:27:12
BY LOOKING AT THEIR CELLS ALONE.

--> Display at 01:15:33:00
A VAST NUMBER OF LIVING THINGS
ARE MADE OF ONLY ONE CELL,

--> Display at 01:15:36:24
AND LACK
THE LEVELS OF ORGANIZATION

--> Display at 01:15:38:28

OF AN ORGANISM LIKE A MOUSE.

--> Display at 01:15:41:18
DESPITE
THEIR EXTRAORDINARY DIVERSITY,

--> Display at 01:15:44:13
THERE IS A CERTAIN UNITY
AMONG CELLS

--> Display at 01:15:46:20
WITH REGARD TO BASIC DESIGN.

--> Display at 01:15:49:15
HUMAN CHEEK CELLS, TAKEN
FROM THE LINING OF THE MOUTH,

--> Display at 01:15:52:20
ARE A GOOD EXAMPLE.

--> Display at 01:15:54:18
NOTICE THAT THESE CELLS

--> Display at 01:15:56:08
ARE INDIVIDUAL,
"SELF-CONTAINED" UNITS.

--> Display at 01:15:59:04
EACH HAS AN INSIDE AND A BARRIER

--> Display at 01:16:02:08
THAT SEPARATES THEM
FROM THE OUTSIDE.

--> Display at 01:16:04:14
THIS BARRIER
IS CALLED THE CELL MEMBRANE,

--> Display at 01:16:08:08
AND ALL CELLS HAVE ONE.

--> Display at 01:16:11:05
THESE CELLS HAVE A NUCLEUS,

--> Display at 01:16:13:04
WHICH CONTAINS
HEREDITARY MATERIAL.

--> Display at 01:16:16:07
NOT ALL CELLS HAVE A NUCLEUS,
BUT WHEN THEY ARE FORMED,

--> Display at 01:16:19:26
ALL CELLS
CARRY HEREDITARY MATERIAL.

--> Display at 01:16:23:23
THE OTHER PARTS OF THE CELL EXIST WITHIN THE CYTOPLASM.

--> Display at 01:16:29:29
ANOTHER THING THAT DESCRIBES
ALL CELLS

--> Display at 01:16:33:01
IS THAT EACH ONE ARISES
FROM A PRE-EXISTING CELL.

--> Display at 01:16:36:24
AND, THE CELL IS WHERE

--> Display at 01:16:38:13
--> Erase at 01:16:42:13
ALL OF THE FUNDAMENTAL PROCESSES OF LIFE TAKE PLACE.

--> Display at 01:16:56:22
Zook: ALL LIFE FORMS,
FROM THE SMALLEST BACTERIUM

--> Display at 01:16:59:05
TO AN ORGANISM LIKE A WHALE,
ARE MADE OF CELLS.

--> Display at 01:17:03:07
HOW DO LIFE FORMS,
WHICH ARE COMPLEX,

--> Display at 01:17:05:25
COMPARE TO A CAR,
WHICH IS ALSO COMPLEX?

--> Display at 01:17:09:19
THE LEVELS OF ORGANIZATION
OF A CAR

--> Display at 01:17:12:02
--> Erase at 01:17:13:27
FORM A TYPE OF HIERARCHY.

--> Display at 01:17:16:11
INSIDE A CAR,
YOU CAN FIND DIFFERENT SYSTEMS

--> Display at 01:17:19:22
THAT OPERATE
TO MAKE IT FUNCTION,

--> Display at 01:17:22:00
AND THESE SYSTEMS
ARE MADE OF DIFFERENT PARTS.

--> Display at 01:17:24:22
A FEW OF THESE PARTS

ARE EVEN MADE OF LAYERS.

--> Display at 01:17:28:20
WITH SUCH COMPLEXITY
IN FORM AND FUNCTION,

--> Display at 01:17:31:23
--> Erase at 01:17:34:11
COULDN'T A CAR
BE CONSIDERED ALIVE?

--> Display at 01:17:38:24
A CAR IS HIGHLY ORGANIZED,

--> Display at 01:17:40:16
BUT THERE IS NO SINGLE SUB-UNIT

--> Display at 01:17:42:24
THAT ACTS AS A BUILDING BLOCK FOR THE CAR.

--> Display at 01:17:45:27
CAR PARTS DON'T REPRODUCE
TO FORM NEW CAR PARTS,

--> Display at 01:17:49:09
AND THE PROCESSES
THAT MAKE THE CAR RUN

--> Display at 01:17:52:07
DO NOT OCCUR
WITHIN ITS SMALLEST PARTS.

--> Display at 01:17:55:11
THE ANALOGY BREAKS DOWN HERE.

--> Display at 01:17:58:11
--> Erase at 01:18:03:12
THERE IS NOTHING WITHIN A CAR THAT COMPARES TO A LIVING CELL.

--> Display at 01:18:07:01
Grisham:
DR. DRIVER'S RESEARCH GROUP

--> Display at 01:18:09:02
FOUND THAT MANY CHILDREN
UP TO MIDDLE SCHOOL

--> Display at 01:18:11:19
THINK THAT EGGS, SEEDS,
SPORES, AND PUPAE ARE NOT ALIVE,

--> Display at 01:18:16:13
BUT CAN GIVE RISE
TO LIVING THINGS.

--> Display at 01:18:21:00

IS THIS POSSIBLE?

--> Display at 01:18:22:28
CAN LIFE COME FROM SOMETHING
THAT IS NOT ALIVE?

--> Display at 01:18:27:29
Abrams: AND AS YOU LOOK AT
EACH OBJECT,

--> Display at 01:18:30:08
TELL US WHY YOU THINK THEY ARE LIVING, DEAD, OR NONLIVING.

--> Display at 01:18:35:16
AND THERE'S A WHOLE BUNCH OF THEM COMING AROUND NOW.

--> Display at 01:18:38:10
WHAT YOU'RE GOING TO DO IS --

--> Display at 01:18:42:12
WHY DO YOU THINK DIRT'S DEAD?

--> Display at 01:18:44:08
DO YOU THINK DIRT'S
LIVING?

--> Display at 01:18:46:18
I DON'T REALLY KNOW
IF IT'S DEAD OR NONLIVING.

--> Display at 01:18:51:03
OR LIVING,
IT MIGHT BE LIVING.

--> Display at 01:18:53:06
IT COULD BE.

--> Display at 01:18:54:20
THE DIRT LOOKS LIKE
SOMETHING THAT'S LIVING.

--> Display at 01:18:58:13
I'D SAY LIVING.

--> Display at 01:19:00:24
IT HELPS LIVING THINGS GROW, LIKE THIS.

--> Display at 01:19:04:06
--> Erase at 01:19:07:05
AND A WORM.

--> Display at 01:19:08:26
BECAUSE IT WASN'T REALLY
PART OF THE CRAB.

--> Display at 01:19:11:18

IT WAS PROTECTING THE CRAB,

--> Display at 01:19:13:12
BUT IT WASN'T REALLY
PART OF ITS BODY.

--> Display at 01:19:16:14
I THINK IT SHOULD GO IN DEAD

--> Display at 01:19:19:07
BECAUSE IT CAN'T HELP IT
IF THE ANIMAL THAT ATE IT

--> Display at 01:19:22:21
ATE OUT ALL OF ITS INSIDES.

--> Display at 01:19:26:01
IF IT WAS DEAD,
IT WOULDN'T BE HAIRY.

--> Display at 01:19:29:14
I MEAN, IF IT WAS NONLIVING,
IT WOULDN'T BE HAIRY,

--> Display at 01:19:31:25
IT WOULDN'T HAVE GROWN.

--> Display at 01:19:33:13
NOW IT'S ALL HAIRY
AND IT WAS PROBABLY ALIVE.

--> Display at 01:19:36:08
AND IF IT WAS HAIRY,
IT MUST HAVE GROWN.

--> Display at 01:19:39:02
WHAT IF WHEN
IT WAS FIRST MADE

--> Display at 01:19:41:26
THAT'S JUST HOW
THE SHELL WAS?

--> Display at 01:19:44:27
IT WAS HAIRY?

--> Display at 01:19:46:27
HOW CAN A SHELL BE HAIRY
IF IT DIDN'T GROW?

--> Display at 01:19:49:24
THE SHELL
DOESN'T BREATHE.

--> Display at 01:19:53:18
AND THE SHELL

DOESN'T EAT OR DRINK.

--> Display at 01:19:58:10

--> Erase at 01:20:01:13

THE BODY DOES,
BUT THE SHELL DOESN'T.

--> Display at 01:20:06:18

--> Erase at 01:20:09:01

Abrams: WHY DID YOU PUT THE EGG IN THE NONLIVING?

--> Display at 01:20:11:09

WHAT EGG?

--> Display at 01:20:12:17

THIS ONE.

--> Display at 01:20:14:23

WELL, IT COULD LIVE
IF YOU,

--> Display at 01:20:18:10

IF YOU LIED ON IT
AND MADE IT WARM

--> Display at 01:20:21:06

--> Erase at 01:20:23:11

AND THEN IT WOULD
TURN INTO A CHICK.

--> Display at 01:20:33:19

POTATO.

--> Display at 01:20:35:12

WELL, I THINK
IT WAS ONCE LIVING

--> Display at 01:20:38:03

BECAUSE IT WAS
LIVING IN THE GROUND.

--> Display at 01:20:40:10

YES.

--> Display at 01:20:41:29

AND IT WAS LIVING ON A PLANT,
A POTATO PLANT.

--> Display at 01:20:44:10

BUT NOW THE PLANT IS GONE
SO IT'S DEAD.

--> Display at 01:20:49:29

I DON'T KNOW
IF POTATOES HAVE SEEDS.

--> Display at 01:20:52:10
LET ME SEE.

--> Display at 01:20:53:21
WHAT ARE THE SEEDS
OF A POTATO?

--> Display at 01:20:56:01
AND I THINK IT COULD
PROBABLY SPROUT

--> Display at 01:20:58:12
FROM THESE LITTLE HOLES HERE SOME ROOTS,

--> Display at 01:21:00:22
OR SPROUT SOMETHING HERE.

--> Display at 01:21:02:19
LOTS OF THINGS
IT COULD COME FROM.

--> Display at 01:21:04:27
WELL, I DON'T KNOW BECAUSE
I DON'T KNOW IF THIS POTATO HERE

--> Display at 01:21:08:11
HAS SEEDS IN IT.

--> Display at 01:21:10:07
IF IT HAS SEEDS IN IT,
YEAH, SURE, I BET IT WILL.

--> Display at 01:21:13:08
--> Erase at 01:21:16:21
BUT THE PROBLEM IS, I DON'T KNOW IF THERE ARE SEEDS INSIDE OF IT.

--> Display at 01:21:20:26
POTATOES DON'T
CONTAIN SEEDS,

--> Display at 01:21:23:04
BUT A NEW PLANT
CAN GROW FROM A POTATO.

--> Display at 01:21:26:07
LIKE SEEDS,

--> Display at 01:21:28:27
THE "EYES" HAVE A ROLE
IN POTATO PLANT REPRODUCTION.

--> Display at 01:21:33:07
THE "EYES" OF A POTATO
CONTAIN A BUD

--> Display at 01:21:35:06

THAT CAN SPROUT, GROW,
AND DEVELOP INTO A NEW PLANT.

--> Display at 01:21:40:25
SPROUTING, GROWTH,

--> Display at 01:21:42:12
DEVELOPMENT,
AND REPRODUCTION

--> Display at 01:21:44:19
--> Erase at 01:21:48:13
ARE ALL PARTS OF THE LIFE SPAN
OF A POTATO PLANT.

--> Display at 01:21:57:17
Narrator: ALL LIVING THINGS
HAVE A LIFE SPAN --

--> Display at 01:22:00:26
FROM A LIVING BEGINNING
TO DEATH.

--> Display at 01:22:04:17
WHAT IS MEANT BY
"A LIVING BEGINNING"?

--> Display at 01:22:09:10
ALL CELLS
COME FROM PRE-EXISTING CELLS.

--> Display at 01:22:12:07
IN THAT SAME SENSE,

--> Display at 01:22:14:00
ALL ORGANISMS
COME FROM OTHER ORGANISMS.

--> Display at 01:22:19:09
THESE NEWBORN MICE, FOR EXAMPLE,

--> Display at 01:22:22:07
RESULTED FROM THE MATING
OF A MALE AND A FEMALE MOUSE.

--> Display at 01:22:25:20
EACH NEWBORN MOUSE

--> Display at 01:22:27:02
CAME FROM A LIVING
FERTILIZED EGG.

--> Display at 01:22:30:24
DURING THEIR LIVES,
THESE MICE WILL SHOW GROWTH --

--> Display at 01:22:35:27
THEY WILL INCREASE IN SIZE
BOTH AS THEIR CELLS GROW

--> Display at 01:22:39:10
AND AS THEIR CELLS
BECOME MORE NUMEROUS.

--> Display at 01:22:42:20
ALL ORGANISMS GROW
AT SOME POINT

--> Display at 01:22:45:24
DURING THEIR LIFE SPAN.

--> Display at 01:22:49:27
MOST ORGANISMS
ALSO SHOW DEVELOPMENT

--> Display at 01:22:52:23
AT ONE OR MORE POINTS
IN THEIR LIVES.

--> Display at 01:22:55:21
DEVELOPMENT REFERS TO ORDERLY, PROGRESSIVE CHANGE

--> Display at 01:22:59:06
RESULTING IN SOME TYPE

--> Display at 01:23:01:09
OF NEW SPECIALIZATION
OF BODY PARTS.

--> Display at 01:23:04:21
DEVELOPMENT OF THE EYES,
EARS, FEET, AND TEETH

--> Display at 01:23:08:19
OF OUR BABY MICE IS ONE EXAMPLE.

--> Display at 01:23:13:00
REPRODUCTION IS ALSO
A CHARACTERISTIC OF LIFE.

--> Display at 01:23:16:23
AT SOME POINT
IN THEIR LIFE SPAN,

--> Display at 01:23:19:04
LIVING THINGS GAIN THE ABILITY TO MAKE MORE OF THEIR OWN KIND,

--> Display at 01:23:23:23
--> Erase at 01:23:26:00
THEY REPRODUCE.

--> Display at 01:23:29:04

THE END OF A LIFE SPAN
IS MARKED BY DEATH.

--> Display at 01:23:33:02
WHEN AN ORGANISM DIES,

--> Display at 01:23:34:26
--> Erase at 01:23:38:09
ITS LIFE-SUSTAINING
PROCESSES STOP.

--> Display at 01:23:57:06
Grisham: THE EGG RAISES
AN INTERESTING QUESTION.

--> Display at 01:24:00:14
A BIRD'S LIFE SPAN
BEGINS AS A SINGLE CELL,

--> Display at 01:24:03:05
--> Erase at 01:24:07:15
A FERTILIZED EGG, WHICH GROWS
AND THEN IT'S LAID BY THE BIRD.

--> Display at 01:24:11:10
Zook: AN EGG FROM A SUPERMARKET
HAS NOT BEEN FERTILIZED,

--> Display at 01:24:14:21
BUT HAS GROWN AND BEEN LAID.

--> Display at 01:24:18:08
AN UNFERTILIZED EGG
WILL NOT DEVELOP INTO NEW LIFE.

--> Display at 01:24:21:21
--> Erase at 01:24:27:15
SO THE EGG THE CHILDREN HANDLED
SHOULD BE CLASSIFIED AS DEAD.

--> Display at 01:24:38:08
--> Erase at 01:24:40:12
COOL.

--> Display at 01:24:43:05
OKAY, NOW IT'S MOVING --
IS THAT ALIVE?

--> Display at 01:24:46:10
NO.
NO.

--> Display at 01:24:48:00
HOW COME?

--> Display at 01:24:49:10

BECAUSE IT'S
NOT MOVING BY ITSELF.

--> Display at 01:24:51:28
THAT'S WHAT YOU'RE
SUPPOSED TO DO.

--> Display at 01:24:54:20
AND YOU MADE IT MOVE
BY LIGHTING IT.

--> Display at 01:25:02:01
I'M SURE IT BELONGS
IN THE NONLIVING.

--> Display at 01:25:09:02
Man: WHY DO YOU SAY THAT?

--> Display at 01:25:11:04
HMM, ACTUALLY I'M NOT SURE.

--> Display at 01:25:13:12
IT'S LIKE SKIN BUT IT'S NOT.

--> Display at 01:25:18:22
AND IT'S NONLIVING.

--> Display at 01:25:21:14
WHEN YOU PLANT THE ORANGE,
THEN IT GROWS.

--> Display at 01:25:25:07
AND SO IT COULD BE DEAD.

--> Display at 01:25:29:18
COME OVER HERE.

--> Display at 01:25:31:14
NO, I'M NOT TOUCHING THAT DISGUSTING THING.

--> Display at 01:25:34:13
THESE LOOK LIKE LITTLE DRIED PEAS OR SEEDS OR SOMETHING.

--> Display at 01:25:37:18
ARE THEY DRIED PEAS?

--> Display at 01:25:38:25
THEY'RE DRIED PEAS,
YES, THEY ARE.

--> Display at 01:25:41:05
SO DO YOU THINK
THEY'RE LIVING, NONLIVING?

--> Display at 01:25:44:17
WELL, WHERE DO PEAS

COME FROM?

--> Display at 01:25:46:22

I THINK THEY'RE LIVING BECAUSE IF THEY WEREN'T LIVING,

--> Display at 01:25:51:04

THEY WOULDN'T HAVE DRIED UP
INTO THE LITTLE PEAS.

--> Display at 01:25:54:00

HOW ARE PEAS GROWN?

--> Display at 01:25:56:04

WE DON'T KNOW
HOW PEAS ARE GROWN.

--> Display at 01:25:58:26

I THINK THEY'RE LIVING
BECAUSE HOW --

--> Display at 01:26:01:11

WHEN THEY WERE USUAL SIZE,

--> Display at 01:26:03:01

HOW THEY COULD HAVE SHRUNK
INTO THOSE LITTLE SIZES.

--> Display at 01:26:07:24

I DON'T THINK
THEY'D GROW AGAIN

--> Display at 01:26:09:22

IF SHE JUST PUT THEM
IN THE GROUND OR SOMETHING.

--> Display at 01:26:12:19

WE DON'T KNOW IF THEY GO UNDERGROUND OR NOT.

--> Display at 01:26:16:09

BECAUSE THEY GREW
WHEN THE PEA POD.

--> Display at 01:26:19:05

AND WE DON'T KNOW
WHEN THE PEA POD GREW.

--> Display at 01:26:21:11

WELL, IT PROBABLY
GREW OUT OF THE GROUND.

--> Display at 01:26:23:07

WHAT IF I TOLD YOU
THE PEA PODS GREW ON A PLANT?

--> Display at 01:26:25:26

THEY DO?

--> Display at 01:26:27:23
MM-HMM.

--> Display at 01:26:30:00
I THINK THEY'RE DEAD.

--> Display at 01:26:33:28
I THINK
THEY'RE DEAD.

--> Display at 01:26:36:04
BECAUSE THEN IF YOU
PUT ONE IN THE GROUND

--> Display at 01:26:40:26
WHEN THEY JUST
CAME OUT OF THE PEA POD,

--> Display at 01:26:43:25
I BET IF YOU
PUT THEM IN THE GROUND,

--> Display at 01:26:45:18
THEY'D GROW A --
A PEA PLANT WOULD GROW.

--> Display at 01:26:50:24
WELL, NOW I'M THINKING NOW

--> Display at 01:26:53:15
THAT YOU MIGHT BE
RIGHT ABOUT THE DEAD

--> Display at 01:26:56:00
BECAUSE AFTER THEY'VE
ALL SHRUNKEN UP,

--> Display at 01:26:58:11
DON'T YOU THINK
THEY WOULD DIE

--> Display at 01:27:00:13
IF YOU DIDN'T DO ANYTHING?

--> Display at 01:27:02:11
THAT'S WHY.

--> Display at 01:27:03:18
SO IF YOU PLANTED THOSE PEAS,

--> Display at 01:27:05:05
THEY WOULDN'T
TURN INTO PEA PLANTS?

--> Display at 01:27:06:22
NO.
NO.

--> Display at 01:27:08:05
BECAUSE THEY'RE
ALL DRIED UP.

--> Display at 01:27:09:18
--> Erase at 01:27:11:18
THEY DON'T HAVE ANYTHING
TO SUPPORT THEM.

--> Display at 01:27:13:22
Abrams: WHAT WAS CLEAR TO ME
IN THE STUDIO

--> Display at 01:27:15:28
WAS THAT THE CHILDREN
TENDED TO ASSOCIATE

--> Display at 01:27:18:17
MOVEMENT AND GROWTH WITH LIFE,

--> Display at 01:27:20:06
AS WELL AS THE POTENTIAL
TO DEVELOP INTO A NEW LIFE --

--> Display at 01:27:23:05
SUCH AS AN EGG
HATCHING INTO A CHICK,

--> Display at 01:27:25:18
OR A SEED GROWING INTO A PLANT.

--> Display at 01:27:27:28
THEY ALSO TENDED TO USE HUMAN
AND ANIMAL CHARACTERISTICS

--> Display at 01:27:31:03
TO DEFINE LIFE,
SUCH AS THINKING OR FEELING.

--> Display at 01:27:34:20
THIS MAKES SENSE
BECAUSE THE CHILDREN USED

--> Display at 01:27:37:08
--> Erase at 01:27:39:25
THEIR OWN EXPERIENCES
AS THEIR REFERENCE.

--> Display at 01:27:47:02
Zook: DR. DRIVER FOUND

--> Display at 01:27:48:20

THAT STUDENTS IN MIDDLE SCHOOL AND BEYOND

--> Display at 01:27:50:19

THINK THAT
ALL LIVING THINGS BREATHE.

--> Display at 01:27:52:28

WHAT WOULD
ELEMENTARY SCHOOL STUDENTS SAY

--> Display at 01:27:55:16

--> Erase at 01:27:59:09

IF THEY WERE ASKED
WHY LIVING THINGS BREATHE?

--> Display at 01:28:02:20

MOST OF THE CHILDREN
IN THE STUDIO IDENTIFIED LIFE

--> Display at 01:28:05:28

WITH THE PROCESSES OF EATING, DRINKING, AND BREATHING.

--> Display at 01:28:09:12

CHILDREN KNOW THAT ORGANISMS NEED TO TAKE THINGS IN,

--> Display at 01:28:12:28

EVEN IF THEIR REASONS LACK DEPTH
IN A SCIENTIFIC SENSE.

--> Display at 01:28:16:25

REASONS LIKE -- ANIMALS EAT BECAUSE THEY NEED FOOD

--> Display at 01:28:20:13

OR BREATHE
BECAUSE THEY NEED AIR.

--> Display at 01:28:23:14

DEEPER UNDERSTANDINGS
CAN BE BUILT LATER,

--> Display at 01:28:26:26

BUT FOR NOW,
CHILDREN HAVE THE BEGINNINGS

--> Display at 01:28:29:24

OF AN UNDERSTANDING
OF THE IMPORTANCE

--> Display at 01:28:31:25

OF MATTER AND ENERGY
IN THE LIVING WORLD.

--> Display at 01:28:35:14

WHEN WE LOOK AT LIFE,
WE ARE LOOKING AT MATTER

--> Display at 01:28:37:24
THAT EXISTS
IN A HIGHLY ORGANIZED

--> Display at 01:28:39:25
AND UNIQUE FORM.

--> Display at 01:28:41:12
OF THE 100 OR SO CURRENTLY KNOWN CHEMICAL ELEMENTS,

--> Display at 01:28:44:23
99% OF AN ORGANISM'S BODY
IS MADE UP OF

--> Display at 01:28:47:28
ONLY A DOZEN OR SO
OF THESE ELEMENTS.

--> Display at 01:28:50:20
LIFE BUILDS ITSELF FROM

--> Display at 01:28:52:24
AND THEREFORE,
REQUIRES THIS MATTER.

--> Display at 01:28:55:29
AND ENERGY IS ALSO REQUIRED
TO SUSTAIN LIFE.

--> Display at 01:28:59:13
--> Erase at 01:29:04:09
EVEN THINKING, SLEEPING,
AND SITTING REQUIRE ENERGY.

--> Display at 01:29:12:11
Narrator: ALL LIFE IS MADE OF
CHEMICAL ELEMENTS --

--> Display at 01:29:16:07
WHAT SCIENTISTS CALL "MATTER."

--> Display at 01:29:19:16
THESE ARE THE SIX MOST
COMMON ELEMENTS

--> Display at 01:29:22:14
--> Erase at 01:29:26:03
COMPOSING LIVING THINGS,
IN ORDER OF THEIR ABUNDANCE.

--> Display at 01:29:31:02
OF THE ELEMENTS
THAT COMPOSE LIVING THINGS,

--> Display at 01:29:34:00
CARBON IS CONSIDERED TO BE

THE MOST DISTINCTIVE.

--> Display at 01:29:39:00
AT A MOLECULAR LEVEL,

--> Display at 01:29:41:03
LIFE IS COMPOSED OF
COMPLEX MOLECULES

--> Display at 01:29:44:04
BUILT FROM CHAINS
OF CARBON ATOMS.

--> Display at 01:29:47:04
THESE ARE CALLED
ORGANIC MOLECULES,

--> Display at 01:29:50:19
AND THEY'RE WHAT CELLS
ARE BUILT FROM.

--> Display at 01:29:53:26
ORGANIC MOLECULES
INCLUDE CARBOHYDRATES,

--> Display at 01:29:57:21
PROTEINS,

--> Display at 01:30:01:16
LIPIDS, LIKE FATS,

--> Display at 01:30:05:11
AND NUCLEIC ACIDS, LIKE DNA.

--> Display at 01:30:10:17
ORGANIC MOLECULES, PLUS WATER,

--> Display at 01:30:14:00
ARE PRIMARILY WHAT WE SEE
WHEN LOOKING AT ANY LIVING THING

--> Display at 01:30:17:15
--> Erase at 01:30:19:17
AT A MOLECULAR LEVEL.

--> Display at 01:30:22:02
NONLIVING THINGS, BY CONTRAST,

--> Display at 01:30:24:15
ARE COMPOSED OF
INORGANIC MOLECULES,

--> Display at 01:30:27:14
--> Erase at 01:30:31:27
WHICH ARE SIMPLER AND HAVE VERY DIFFERENT CHEMICAL COMPOSITION.

--> Display at 01:30:39:23
LIVING THINGS REQUIRE
A CONSTANT SUPPLY

--> Display at 01:30:42:04
OF NEW MATTER AND ENERGY
TO SUSTAIN LIFE.

--> Display at 01:30:46:20
PLANTS ARE
AN IMPORTANT EXAMPLE OF THIS.

--> Display at 01:30:50:20
THROUGH PHOTOSYNTHESIS,

--> Display at 01:30:52:29
PLANTS TAKE IN
INORGANIC MOLECULES --

--> Display at 01:30:55:25
CARBON DIOXIDE FROM THE AIR,
AND WATER,

--> Display at 01:30:58:27
AND USE THE SUN'S ENERGY
TO FORM ORGANIC MOLECULES

--> Display at 01:31:03:05
--> Erase at 01:31:05:25
THAT BECOME
THE PLANT'S OWN FOOD.

--> Display at 01:31:09:18
--> Erase at 01:31:13:29
THIS FOOD IS THEN USED
TO BUILD AND FUEL THE PLANT.

--> Display at 01:31:16:11
OTHER TYPES OF ORGANISMS
CANNOT MAKE THEIR OWN FOOD.

--> Display at 01:31:20:24
--> Erase at 01:31:23:05
INSTEAD,
THEY MUST USE LIVING SOURCES.

--> Display at 01:31:26:04
A HORSE IS A GOOD EXAMPLE.

--> Display at 01:31:28:11
TO A HORSE, GRASS REPRESENTS
A READY-MADE SOURCE

--> Display at 01:31:31:05
OF MATTER AND ENERGY

--> Display at 01:31:33:02
BECAUSE IT CONTAINS
ORGANIC MOLECULES

--> Display at 01:31:35:15
ALREADY FORMED BY A GRASS PLANT.

--> Display at 01:31:38:25
ONCE CONSUMED,

--> Display at 01:31:40:08
THE ORGANIC MOLECULES
IN THE GRASS

--> Display at 01:31:42:20
--> Erase at 01:31:47:00
ARE THEN REORGANIZED
TO BUILD AND FUEL THE HORSE.

--> Display at 01:31:49:18
LIVING THINGS
THUS OBTAIN MATTER AND ENERGY

--> Display at 01:31:52:23
IN ONE OF TWO WAYS --

--> Display at 01:31:54:23
THEY MAKE IT THEMSELVES
FROM NON-LIVING SOURCES,

--> Display at 01:31:58:08
OR THEY GET IT
FROM OTHER LIVING SOURCES

--> Display at 01:32:01:27
--> Erase at 01:32:03:27
BY CONSUMING IT.

--> Display at 01:32:21:03
MATTER AND ENERGY

--> Display at 01:32:22:15
ARE CHALLENGING SUBJECTS
FOR STUDENTS.

--> Display at 01:32:24:25
WE WILL BE LOOKING INTO THIS IN MORE DEPTH LATER IN THE COURSE.

--> Display at 01:32:30:01
ONE WAY TO REMEMBER
THAT ALL LIFE FORMS

--> Display at 01:32:32:04
ARE MAINLY
VARIOUS COMBINATIONS

--> Display at 01:32:34:03
OF VERY FEW
CHEMICAL ELEMENTS

--> Display at 01:32:36:05
IS WHAT I CALL
THE SPONCH CAFE.

--> Display at 01:32:39:23
S STANDS
FOR THE ELEMENT SULFUR,

--> Display at 01:32:42:16
P FOR PHOSPHOROUS,

--> Display at 01:32:44:21
CAN YOU GUESS WHAT ELEMENTS
THE OTHER LETTERS STAND FOR?

--> Display at 01:32:48:08
PLEASE VISIT OUR WEB SITE FOR MORE ABOUT THIS TEACHING TOOL.

--> Display at 01:32:53:29
IN TODAY'S FEATURED CLASSROOM,

--> Display at 01:32:56:28
LAURAJÓ KELLY
AND HER SECOND GRADE STUDENTS

--> Display at 01:32:59:07
IN BROOKLYN, NEW YORK,
ARE EXPLORING A LESSON

--> Display at 01:33:02:03
FROM THE SCIS 3
LIFE CYCLES UNIT TITLED --

--> Display at 01:33:05:26
--> Erase at 01:33:08:19
"LIVING, DEAD, OR NONLIVING."

--> Display at 01:33:10:06
ANIMAL OR PLANT, CAN YOU NAME
AN ORGANISM FOR ME?

--> Display at 01:33:12:25
A PERSON.
A PERSON.

--> Display at 01:33:15:04
CAN YOU?

--> Display at 01:33:16:20
A MONKEY.
A MONKEY.

--> Display at 01:33:18:00
A LION.
A LION.

--> Display at 01:33:19:10
A COBRA.
A COBRA.

--> Display at 01:33:20:25
THE FIRST THREE LESSONS
THAT WE'VE DONE,

--> Display at 01:33:22:27
ONE WAS ORGANISMS.

--> Display at 01:33:24:23
THE NEXT LESSON WAS ORGANISMS AND THEIR HABITATS.

--> Display at 01:33:28:22
THEN WE MOVE ON
TO THE FOOD CHAIN,

--> Display at 01:33:31:06
WHICH THEY FIND AMAZING.

--> Display at 01:33:34:05
ALL THESE THREE LESSONS
THAT WE'VE DONE

--> Display at 01:33:36:09
SET US UP FOR TOMORROW

--> Display at 01:33:37:24
WHICH IS TEACHING LIVING, NONLIVING, AND DEAD.

--> Display at 01:33:41:13
TELL ME SOME THINGS THAT YOU NOTICE ABOUT WIPPLES.

--> Display at 01:33:45:29
HIS FEET ARE RED.

--> Display at 01:33:47:20
HE'S BREATHING.
EATING.

--> Display at 01:33:50:03
EATING, GOOD,
VERY GOOD.

--> Display at 01:33:52:17
WHEN YOUR HEART
IS BEATING.

--> Display at 01:33:54:27
YOUR HEART BEATS, OKAY.

--> Display at 01:33:57:01
LIFE SCIENCE,
FOR ME, IN THE BEGINNING,

--> Display at 01:33:59:26
WAS A LITTLE SCARY,

--> Display at 01:34:01:07
BECAUSE I HAVE
MY OWN SQUIRMISH FEELINGS

--> Display at 01:34:04:12
ABOUT LIVING THINGS
AND CREEPY-CRAWLY THINGS,

--> Display at 01:34:07:28
AND I DIDN'T WANT
TO PUT THAT ON THE CHILDREN.

--> Display at 01:34:10:11
BECAUSE IF I'M --
THEY WILL NOT TOUCH IT,

--> Display at 01:34:13:04
THEY WILL NOT GO NEAR IT.

--> Display at 01:34:14:18
SO I HAD TO GET IN TOUCH
WITH MY INNER CHILD,

--> Display at 01:34:16:28
I REALLY DID,

--> Display at 01:34:18:14
AND I HAD TO REMEMBER
MY MOTHER DOING LAUNDRY

--> Display at 01:34:20:05
AND PULLING OUT WORMS
OUT OF MY POCKET.

--> Display at 01:34:22:21
THEN I REALIZED,
I CAN DO THIS AGAIN.

--> Display at 01:34:25:29
IT'S JUST, I HAVE TO BE A KID.

--> Display at 01:34:28:01
HE HAS RED EYES.

--> Display at 01:34:31:04
WHAT ELSE,
DO YOU REMEMBER?

--> Display at 01:34:34:02

SOMEBODY SAID IT BEFORE
AND I TOLD YOU TO REMEMBER THAT.

--> Display at 01:34:36:26
REPRODUCING.

--> Display at 01:34:38:09
AND WHAT DOES
THAT WORD MEAN?

--> Display at 01:34:40:12
IT MEANS WHEN YOU'RE
LIKE A GROWN UP

--> Display at 01:34:43:14
AND THEN YOU HAVE MORE BABIES

--> Display at 01:34:45:21
AND THAT BAY HAS MORE BABIES
AND MORE BABIES

--> Display at 01:34:49:05
AND MORE BABIES AND MORE BABIES.

--> Display at 01:34:51:21
YES.

--> Display at 01:34:52:28
SO IN ORDER FOR SOMETHING TO BE ALIVE OR LIVING,

--> Display at 01:34:57:14
IT NEEDS TO BE ABLE
TO REPRODUCE.

--> Display at 01:35:01:09
BEING ABLE
TO REALLY LOOK AT SOMETHING,

--> Display at 01:35:03:10
KNOWING WHAT PROPERTIES ARE.

--> Display at 01:35:05:13
BEING ABLE TO DESCRIBE
"IT'S MOVING, IT'S EATING,

--> Display at 01:35:10:04
IT'S SWIMMING,
IT'S BIG, IT'S SMALL,"

--> Display at 01:35:13:01
IT PUSHES THEM
TO THE TERM "LIVING."

--> Display at 01:35:17:05
NOW WE HAVE OUR FRIENDS
FROM YESTERDAY.

--> Display at 01:35:20:08
ALL OF THEM DIED.

--> Display at 01:35:23:07
HOW DO YOU KNOW THAT
THEY'RE NOT ALIVE?

--> Display at 01:35:26:17
OUCH.

--> Display at 01:35:28:08
BECAUSE THEY'RE NOT SWIMMING, THEY'RE JUST STAYING FLAT.

--> Display at 01:35:32:08
OKAY.

--> Display at 01:35:33:27
AND IF THEY WAS ALIVE,

--> Display at 01:35:35:02
THEY COULD BE
SWIMMING DOWN THERE.

--> Display at 01:35:36:29
BUT THEY'RE FLOATING UP.

--> Display at 01:35:40:04
BECAUSE THEIR GILLS
ARE NOT MOVING.

--> Display at 01:35:42:26
THEY'RE NOT REPRODUCING.

--> Display at 01:35:45:06
THEY'RE NOT
REPRODUCING.

--> Display at 01:35:47:14
OKAY, SO WE HAVE
LIVING AND DEAD.

--> Display at 01:35:49:25
THERE'S ONE MORE.

--> Display at 01:35:52:07
THERE'S ONE MORE.

--> Display at 01:35:55:29
All: NONLIVING.

--> Display at 01:35:58:22
HOW DO YOU KNOW?

--> Display at 01:36:01:06
BECAUSE HE'S NOT ALIVE

AND HE WAS NEVER ALIVE.

--> Display at 01:36:03:22
WHEN ONE OF THE STUDENTS

--> Display at 01:36:06:12
WAS LOOKING AT THE TEDDY BEAR
AS NONLIVING,

--> Display at 01:36:09:25
AND HE SAID, "WELL,
I THINK IT WAS ALIVE BEFORE,

--> Display at 01:36:13:21
BECAUSE IT COMES FROM COTTON,"

--> Display at 01:36:15:26
I WASN'T READY FOR IT THEN,

--> Display at 01:36:17:18
AND I DIDN'T WANT
TO CAUSE ANY OTHER CONFUSION

--> Display at 01:36:21:02
WITH THE OTHER CHILDREN,

--> Display at 01:36:22:13
BUT THERE ARE THINGS
THAT ARE NONLIVING

--> Display at 01:36:25:21
THAT ARE MADE FROM THINGS
THAT WERE ONCE ALIVE.

--> Display at 01:36:28:24
AND THEN I WILL
CALL YOUR PARTNER

--> Display at 01:36:31:19
TO GO TO THE BACK OF THE ROOM.

--> Display at 01:36:33:24
AND YOU ARE GOING TO GET
THIS GREEN STUFF.

--> Display at 01:36:38:18
I DON'T KNOW WHAT IT IS.

--> Display at 01:36:40:13
IT'S GREEN STUFF.

--> Display at 01:36:41:28
AND I WANT YOU TO THINK
WITH YOUR PARTNER,

--> Display at 01:36:45:21

THE PERSON THAT YOU ARE
SITTING RIGHT NEXT TO,

--> Display at 01:36:48:25
COME UP WITH --
IF YOU THINK IT IS LIVING,

--> Display at 01:36:52:02
--> Erase at 01:36:55:16
DEAD, OR NONLIVING.

--> Display at 01:36:59:19
I THINK IT'S LIVING.

--> Display at 01:37:01:14
--> Erase at 01:37:05:22
I PULLED IT
AND IT'S MADE OUT OF STRING.

--> Display at 01:37:08:13
IF IT WAS NONLIVING,

--> Display at 01:37:10:09
IT WOULD HAVE THE COLOR
THAT IT WAS.

--> Display at 01:37:13:24
--> Erase at 01:37:17:15
IT IF WASN'T NONLIVING,
IT WOULD BE BROWN AND CRUNCHY.

--> Display at 01:37:20:17
I THINK IT'S LIVING.

--> Display at 01:37:24:19
--> Erase at 01:37:28:24
AND IF IT WAS LIVING,
IT WOULD BE GROWING.

--> Display at 01:37:34:29
IT LOOKS LIKE IT'S DEAD
BECAUSE IT'S HARD.

--> Display at 01:37:37:01
IT IS DEAD BECAUSE THE PERSON PICKED IT OUT OF THE WATER

--> Display at 01:37:40:28
AND ITS STEM IS BROKEN NOW.

--> Display at 01:37:43:00
BUT HOW DO YOU KNOW?

--> Display at 01:37:44:11
Kelly: I NEED YOU NOW

--> Display at 01:37:46:12

TO TELL ME WHAT YOU THINK.

--> Display at 01:37:49:10
Student: I THINK IT'S LIVING

--> Display at 01:37:51:10
BECAUSE USUALLY WHEN
UNDERSEA PLANTS ARE DEAD,

--> Display at 01:37:55:25
THEY ARE BROWN.

--> Display at 01:37:58:05
BUT THIS IS LIKE A DIRT
AND, LIKE, GREENISH COLOR.

--> Display at 01:38:04:05
THE GREEN STUFF --
IT USED TO BE ALIVE,

--> Display at 01:38:08:01
AND I THINK IT'S NOT ALIVE ANYMORE BECAUSE THE STEM,

--> Display at 01:38:13:03
IT LOOKS KIND OF BLACKISH
AND BROWNISH KIND OF.

--> Display at 01:38:19:07
Student:
I THINK IT'S NONLIVING BECAUSE

--> Display at 01:38:23:02
WHEN I FEEL IT,
IT FEELS LIKE THREAD.

--> Display at 01:38:27:03
Kelly: OKAY, SO YOU KNOW I THINK WE'RE ALL A LITTLE BIT UNSURE.

--> Display at 01:38:31:02
SO WHAT CAN WE DO TO FIND OUT?

--> Display at 01:38:35:10
Student: WE COULD DIG IT OUT
AND PUT IT IN A POT OF SOIL

--> Display at 01:38:38:29
AND WATER IT TO SEE IF IT GROWS.

--> Display at 01:38:41:06
Kelly: AND WHAT ARE YOU DOING WHEN YOU PUT IT IN SOIL

--> Display at 01:38:43:28
AND WATCH IT?

--> Display at 01:38:45:03
DOING AN EXPERIMENT.

--> Display at 01:38:46:26
YOU'RE DOING
AN EXPERIMENT.

--> Display at 01:38:49:11
TRY TO COME UP WITH
AN EXPERIMENT

--> Display at 01:38:53:27
THAT IS GOING TO
GIVE YOU THE ANSWER

--> Display at 01:38:57:00
TO FIND OUT
IF IT IS ALL THREE

--> Display at 01:39:01:06
OR IF IT'S
ONE OF THOSE THREE.

--> Display at 01:39:03:24
I AM GOING TO FIND OUT
THE ANSWER BY MEASURING.

--> Display at 01:39:09:04
AND I AM GOING TO PLANT IT
AND SEE IF IT GROWS.

--> Display at 01:39:13:02
I THINK THE GREEN STUFF
IS SEAWEED.

--> Display at 01:39:16:22
I ALSO THINK THAT IT IS DEAD.

--> Display at 01:39:20:15
MY EXPERIMENT IS SIMPLE.

--> Display at 01:39:24:07
FIRST YOU HAVE TO MEASURE
THE GREEN STUFF.

--> Display at 01:39:28:03
AFTER THAT, PUT THE GREEN STUFF IN A POT OF SOIL.

--> Display at 01:39:32:06
Kelly: WE'RE ALWAYS INVESTIGATING THINGS

--> Display at 01:39:34:17
IN EVERYTHING IN OUR LIVES.

--> Display at 01:39:36:08
IT'S A DAILY PART OF LIFE.

--> Display at 01:39:38:18

AND THROUGH OUR INVESTIGATIONS
IS WHERE WE DRAW CONCLUSIONS

--> Display at 01:39:42:26
TO WHY THINGS ARE
THE WAY THEY ARE.

--> Display at 01:39:45:10
AND I THINK CHILDREN NEED
MORE OF THAT.

--> Display at 01:39:48:20
I WANT TO KNOW
IF THE PLANT IS LIVING.

--> Display at 01:39:52:02
I WILL DO
AN EXPERIMENT TO SEE.

--> Display at 01:39:54:19
OKAY, GOOD.

--> Display at 01:39:56:22
THEY NEED THAT SO THAT THEY CAN SURVIVE IN LIFE LATER ON.

--> Display at 01:40:01:21
--> Erase at 01:40:06:14
AND SCIENCE GIVES THEM
THAT OPPORTUNITY TO BE CURIOUS.

--> Display at 01:40:07:28
THE GREEN STUFF THAT
THE CLASS IS WORKING WITH

--> Display at 01:40:10:06
IS IN FACT A BRYOZOAN --
AN AQUATIC ANIMAL.

--> Display at 01:40:13:24
THE BRANCH-LIKE STRUCTURE
OF A LIVE BRYOZOAN

--> Display at 01:40:16:12
IS ACTUALLY
A COLONY CONTAINING

--> Display at 01:40:18:14
MICROSCOPIC INDIVIDUALS CONNECTED TOGETHER.

--> Display at 01:40:21:19
THE TENTACLE-LIKE STRUCTURES SEEN HERE CAPTURE FOOD.

--> Display at 01:40:25:12
I'LL BET STUDENTS
WERE SURPRISED

--> Display at 01:40:27:17
WHEN LAURAJÓ REVEALED
THIS INFORMATION!

--> Display at 01:40:30:05
FOR SURE.

--> Display at 01:40:31:12
LIFE FORMS AREN'T ALWAYS
WHAT THEY APPEAR TO BE.

--> Display at 01:40:34:03
SOMETHING THAT LOOKS LIKE
A PLANT ISN'T ALWAYS A PLANT.

--> Display at 01:40:38:16
THE EXPERIMENTS THAT
LAURAJÓ'S STUDENTS PROPOSED

--> Display at 01:40:42:03
INVOLVED PLANTING
THE GREEN STUFF

--> Display at 01:40:44:12
AND WATCHING FOR GROWTH.

--> Display at 01:40:46:17
THE IDEA OF CHANGING A CONDITION

--> Display at 01:40:48:21
AND WATCHING FOR A RESPONSE

--> Display at 01:40:50:17
--> Erase at 01:40:53:24
LEADS US TO
OUR NEXT CHARACTERISTIC OF LIFE.

--> Display at 01:41:05:08
Narrator:
IN THE NATURAL WORLD,

--> Display at 01:41:07:08
THE CONDITIONS IN AN ORGANISM'S
EXTERNAL ENVIRONMENT

--> Display at 01:41:10:08
ARE CONSTANTLY CHANGING --

--> Display at 01:41:12:12
LIGHT, MOISTURE,
AND TEMPERATURE,

--> Display at 01:41:16:22
--> Erase at 01:41:19:23
EVEN WHAT
OTHER ORGANISMS ARE DOING.

--> Display at 01:41:21:27
IN THE FACE
OF CHANGING CONDITIONS,

--> Display at 01:41:24:06
REACTIONS ARE OFTEN
REQUIRED FOR SURVIVAL.

--> Display at 01:41:29:03
THE CONDITION
THAT TRIGGERS A REACTION

--> Display at 01:41:31:12
CAN BE CALLED A STIMULUS --

--> Display at 01:41:34:00
THE REACTION ITSELF
CAN BE CALLED A RESPONSE.

--> Display at 01:41:39:21
AN ORGANISM'S INTERNAL
ENVIRONMENT CAN ALSO CHANGE.

--> Display at 01:41:44:05
BODY TEMPERATURE
AND WATER BALANCE ARE EXAMPLES

--> Display at 01:41:47:07
OF KEY INTERNAL CONDITIONS
THAT CAN VARY.

--> Display at 01:41:51:03
LET'S LOOK AT A HUMAN EXAMPLE.

--> Display at 01:41:54:27
SOARING AIR TEMPERATURES

--> Display at 01:41:56:19
CAN CAUSE THE BODY
TO BECOME OVERHEATED.

--> Display at 01:42:00:10
SWEATING IS A RESPONSE TO THAT.

--> Display at 01:42:02:15
AS SWEAT EVAPORATES,

--> Display at 01:42:03:24
HEAT IS CARRIED AWAY
FROM THE BODY.

--> Display at 01:42:07:17
THIS PREVENTS
A POTENTIALLY DANGEROUS RISE

--> Display at 01:42:10:11
IN BODY TEMPERATURE.

--> Display at 01:42:13:25
WATER LOST FROM SWEATING,

--> Display at 01:42:15:17
AS WELL AS INCREASED USE
DURING PHYSICAL EXERTION,

--> Display at 01:42:18:25
CAN CAUSE DEHYDRATION.

--> Display at 01:42:22:01
A SENSE OF THIRST DRIVES
THESE RUNNERS TO DRINK WATER

--> Display at 01:42:25:25
--> Erase at 01:42:28:16
TO MAINTAIN
THE RIGHT WATER BALANCE.

--> Display at 01:42:33:21
RESPONSE TO CHANGES

--> Display at 01:42:35:08
IN AN ORGANISM'S
EXTERNAL ENVIRONMENT,

--> Display at 01:42:37:28
AND COUNTLESS OTHER INTERNAL CONDITIONS,

--> Display at 01:42:40:08
--> Erase at 01:42:42:03
IS CRUCIAL FOR SURVIVAL.

--> Display at 01:42:58:07
ONE OF THE BEST WAY TO LEARN SCIENCE IS TO ACTUALLY DO IT.

--> Display at 01:43:01:22
THROUGHOUT THESE SESSIONS
YOU'LL HAVE A CHANCE

--> Display at 01:43:03:26
TO BUILD MODELS
OF LIVING SYSTEMS.

--> Display at 01:43:06:06
IN THIS WAY
YOU'LL BE ABLE TO APPLY

--> Display at 01:43:07:25
YOUR UNDERSTANDINGS
OF SESSION TOPICS.

--> Display at 01:43:10:26

WE ALSO HOPE
THIS WILL PROVIDE YOU WITH IDEAS

--> Display at 01:43:13:16
FOR CLASSROOM ACTIVITIES.

--> Display at 01:43:16:06
Man: THIS IS WHAT I CALL
MY "GET A LIFE" NECKLACE.

--> Display at 01:43:19:03
IN EACH ONE OF THESE TUBES,
I'VE CREATED CONDITIONS

--> Display at 01:43:21:28
THAT WILL HELP ME TEST
A SUSPICIOUS OBJECT

--> Display at 01:43:24:07
FOR SIGNS OF LIFE.

--> Display at 01:43:26:14
HELLO, I'M PAUL WILLIAMS.

--> Display at 01:43:28:22
ASKING THE QUESTION
"WHAT IS LIFE?"

--> Display at 01:43:30:19
IS A GREAT WAY
TO EMBARK ON AN ADVENTURE

--> Display at 01:43:33:01
IN STUDYING
THE LIVING WORLD.

--> Display at 01:43:35:14
I CALL THIS APPROACH
"BOTTLE BIOLOGY."

--> Display at 01:43:38:09
THERE ARE FOUR
BOTTLE BIOLOGY SYSTEMS

--> Display at 01:43:40:15
TO CHOOSE FROM FOR YOUR OWN ESSENTIAL SCIENCE STUDY.

--> Display at 01:43:45:23
THE TERRAQUA SYSTEM INVOLVES CREATING LAND AND WATER HABITATS

--> Display at 01:43:49:23
TO STUDY THE BASICS --
OBSERVING AND DESCRIBING LIFE.

--> Display at 01:43:54:29
IF LIFE CYCLES OF PLANTS

AND ANIMALS INTEREST YOU,

--> Display at 01:43:58:27
THE BRASSICA
AND BUTTERFLY SYSTEM

--> Display at 01:44:01:14
ALLOWS YOU TO STUDY BOTH.

--> Display at 01:44:05:03
THE FIELD POPULATION SYSTEM

--> Display at 01:44:07:11
FOCUSES ON THE BASICS
OF BIOLOGICAL EVOLUTION

--> Display at 01:44:10:12
AS YOU LOOK
AT A PLANT POPULATION

--> Display at 01:44:12:18
AND WHAT HAPPENS WHEN
A PLANT-EATER IS INTRODUCED.

--> Display at 01:44:18:03
DO FOOD WEBS
OR DECOMPOSITION INTRIGUE YOU?

--> Display at 01:44:20:29
THEN THE ECOCOLUMN SYSTEM
MAY BE FOR YOU.

--> Display at 01:44:24:29
EACH SYSTEM USES
RECYCLABLE MATERIALS,

--> Display at 01:44:27:24
LIKE SODA BOTTLES,
DELI CONTAINERS,

--> Display at 01:44:30:27
AND FILM CANISTERS.

--> Display at 01:44:33:13
LIVING MATERIALS
FOR STOCKING YOUR SYSTEM

--> Display at 01:44:35:10
ARE ALSO EASILY OBTAINED,

--> Display at 01:44:37:20
THE WEB SITE WILL CONTAIN WEEK-BY-WEEK SUGGESTIONS

--> Display at 01:44:40:09
TO HELP YOUR STUDY ALONG.

--> Display at 01:44:41:16
AND IT IS ALSO A PLACE

--> Display at 01:44:43:06
TO SHARE OBSERVATIONS
AND EXPERIENCES WITH COLLEAGUES,

--> Display at 01:44:46:10
IN ADDITION, YOU MAY LOOK IN ON OUR SYSTEM'S PROGRESS.

--> Display at 01:44:50:19
EACH WEEK DURING BOTTLE BIOLOGY,

--> Display at 01:44:52:19
WE WILL INVESTIGATE
ONE OF THESE SYSTEMS

--> Display at 01:44:54:24
AND SEE WHAT WE
CAN LEARN FROM IT.

--> Display at 01:44:57:18
THANK YOU, PAUL.

--> Display at 01:44:58:29
WE LOOK FORWARD
TO CHECKING IN WITH YOU

--> Display at 01:45:00:19
DURING EACH OF
OUR FUTURE SESSIONS.

--> Display at 01:45:03:27
THE QUESTION "WHAT IS LIFE?"
IS IMPORTANT TO SCIENTISTS

--> Display at 01:45:06:19
WHO ARE LOOKING
FOR SIGNS OF LIFE

--> Display at 01:45:08:13
ELSEWHERE IN THE UNIVERSE.

--> Display at 01:45:10:04
WE TALKED TO DR. GARY RUVKUN,

--> Display at 01:45:12:13
PROFESSOR OF GENETICS
AT HARVARD MEDICAL SCHOOL

--> Display at 01:45:14:29
TO FIND OUT ABOUT HIS RESEARCH.

--> Display at 01:45:17:12
HE IS HEADING
A GROUP OF SCIENTISTS

--> Display at 01:45:19:01
WORKING WITH NASA
WHO HOPE TO FIND OUT

--> Display at 01:45:22:06
IF LIFE EXISTS ON MARS --

--> Display at 01:45:24:15
A QUESTION THAT MANY PEOPLE
HAVE ASKED OVER THE CENTURIES.

--> Display at 01:45:28:14
Ruvkun: THIS IS A BOOK I FOUND
WHEN I WAS GOING THROUGH

--> Display at 01:45:30:18
MY CLOSETS AT THE HOUSE
I GREW UP IN.

--> Display at 01:45:33:01
AND THIS WAS
MY FIRST SCIENCE BOOK.

--> Display at 01:45:34:27
YOU CAN EVEN SEE MY NAME IN IT,

--> Display at 01:45:38:22
WRITTEN WHEN I WAS ABOUT SIX.

--> Display at 01:45:42:07
AND I'VE HAD THIS ON
MY BOOKSHELF FOR 10 YEARS HERE,

--> Display at 01:45:44:21
AND I'VE ACTUALLY HAD --

--> Display at 01:45:46:11
WHEN PEOPLE COME INTO MY OFFICE WHO ARE WORKING SCIENTISTS

--> Display at 01:45:48:16
AND TALK TO ME,
THEY'LL LOOK UP AND SAY,

--> Display at 01:45:50:11
"WHOA, 'THE WORLD OF SCIENCE,'
I HAD THAT WHEN I WAS A KID!"

--> Display at 01:45:54:04
SO THIS WAS INFLUENTIAL TO
A LOT OF US, I THINK.

--> Display at 01:45:57:22
*40 SECONDS AWAY
FROM THE APOLLO 11 LIFTOFF.*

--> Display at 01:46:02:01
MANY OF US WHO GREW UP
ON THE SPACE PROGRAM.

--> Display at 01:46:04:13
I'M 50 YEARS OLD.

--> Display at 01:46:06:10
I WATCHED EVERY LAUNCH AS A KID,

--> Display at 01:46:09:01
--> Erase at 01:46:12:02
WHEN I WAS
5, 6, 7, 8, 9, 10.

--> Display at 01:46:16:07
A PROJECT THAT I'M WORKING ON
RIGHT NOW WITH NASA

--> Display at 01:46:18:07
IS TO TEST THE QUESTION,
"IS THERE LIFE ON MARS?"

--> Display at 01:46:21:19
AND PART OF THAT PROCESS
IS TO DECIDE

--> Display at 01:46:26:02
HOW DO YOU DETECT LIFE,
AND WHAT IS LIFE?

--> Display at 01:46:32:15
DNA IS NOW
THE BEST DETECTOR OF LIFE.

--> Display at 01:46:34:17
IT'S A NARROW DEFINITION
OF LIFE,

--> Display at 01:46:37:04
BUT THAT NARROWNESS WAS ARRIVED AT SORT OF FAIR AND SQUARE.

--> Display at 01:46:40:20
SO IF YOU TAKE THINGS
THAT YOU KNOW ARE LIVING --

--> Display at 01:46:43:20
YOU KNOW, TREES,
AND BACTERIA YOU CAN GROW,

--> Display at 01:46:47:10
AND ANIMALS, AND ASK,
"WHAT DO THEY HAVE IN COMMON?"

--> Display at 01:46:50:11
--> Erase at 01:46:52:27

THEY ALL HAVE DNA IN COMMON.

--> Display at 01:46:55:08
WHAT WE'RE TRYING TO DO
IS MAKE A VERY SIMPLE INSTRUMENT

--> Display at 01:47:01:11
WITH THIS KIND
OF DNA AMPLIFIER.

--> Display at 01:47:03:29
SO IT'S AN AMPLIFIER

--> Display at 01:47:05:12
THAT CAN AMPLIFY SOMETHING
A MILLION FOLD.

--> Display at 01:47:07:27
SO WHAT WE WOULD PROPOSE
IS THAT NASA DELIVERS

--> Display at 01:47:10:25
SOME DIRT TO OUR INSTRUMENT.

--> Display at 01:47:12:26
AND THE AMOUNT OF DIRT
WE ARE TALKING ABOUT

--> Display at 01:47:14:14
IS LESS THAN A TEASPOON.

--> Display at 01:47:16:07
AND FROM THAT TEASPOON OF DIRT,

--> Display at 01:47:18:00
WE'D USE PROCEDURES
THAT WOULD EXTRACT DNA

--> Display at 01:47:21:01
AND THEN TRY AND AMPLIFY
WHAT'S IN THERE ON MARS

--> Display at 01:47:24:14
AND THEN SEND BACK THE SIGNAL, DID I DETECT DNA OR NOT.

--> Display at 01:47:30:04
WHY WOULD ANYBODY
EXPECT LIFE ON MARS

--> Display at 01:47:32:25
TO LOOK LIKE LIFE ON EARTH?

--> Display at 01:47:34:27
AND THIS IS THE PART
OF THE PROJECT

--> Display at 01:47:38:04
THAT IS MOST SUBJECT TO DEBATE.

--> Display at 01:47:39:24
IN OTHER WORDS,
WE HAVE TO CONVINCING NASA

--> Display at 01:47:41:24
THAT THIS IS
SOMETHING REASONABLE.

--> Display at 01:47:44:03
WE KNOW THAT
3 BILLION YEARS AGO,

--> Display at 01:47:47:00
EARTH AND MARS WERE JUST EXCHANGING STUFF LIKE CRAZY.

--> Display at 01:47:50:02
A METEOR WOULD HIT EARTH,
SPEW STUFF OUT

--> Display at 01:47:53:00
AND IT WOULD GO
ALL THE WAY TO MARS.

--> Display at 01:47:55:07
SO IT'S HARD TO IMAGINE

--> Display at 01:47:56:13
THAT IF EARTH
HAD BACTERIA AND LIFE,

--> Display at 01:47:59:03
AND THAT IT WAS SPEWING OUT METEORS LIKE CRAZY

--> Display at 01:48:02:00
3 BILLION YEARS AGO,

--> Display at 01:48:03:15
THAT IT WOULDN'T HAVE
INFECTED IT, ESSENTIALLY, MARS.

--> Display at 01:48:07:03
MANY SORT OF WELL-TRAINED SCIENTISTS

--> Display at 01:48:10:25
WHEN WE TELL THEM
WHAT WE ARE UP TO

--> Display at 01:48:12:27
THEY SAY WE'RE WASTING OUR TIME, IT'S GOING TO BE BEREFT OF LIFE.

--> Display at 01:48:16:26
MY COUNTER TO THAT IS

--> Display at 01:48:19:23
THAT NEVER UNDERESTIMATE
WHAT MICROBES CAN DO.

--> Display at 01:48:23:10
MICROBES
ARE INCREDIBLY ADAPTABLE.

--> Display at 01:48:25:05
THERE ARE MICROBES THAT CAN GROW

--> Display at 01:48:27:01
IN THE CORE
OF NUCLEAR POWER PLANTS.

--> Display at 01:48:30:10
THERE ARE MICROBES THAT GROW
IN THE STRATOSPHERE.

--> Display at 01:48:32:18
THERE ARE MICROBES
THAT GROW IN HOT SPRINGS

--> Display at 01:48:34:23
AND NEXT TO LAVA FLOWS.

--> Display at 01:48:36:22
MICROBES ARE INCREDIBLE.

--> Display at 01:48:38:14
SO I WOULD NEVER
BET AGAINST THEM.

--> Display at 01:48:41:26
MARS IS AN EXTREME ENVIRONMENT.

--> Display at 01:48:44:14
AND THE TYPES OF ORGANISMS
DR. RUVKUN MIGHT FIND

--> Display at 01:48:47:11
WOULD HAVE TO BE ADAPTED
TO THESE EXTREME CONDITIONS.

--> Display at 01:48:51:01
YET ORGANISMS,
CALLED EXTREMOPHILES,

--> Display at 01:48:54:04
ARE FOUND IN SOME VERY HOSTILE PLACES ON EARTH.

--> Display at 01:48:56:19
SO IT'S REASONABLE TO EXPECT

--> Display at 01:48:59:00
THAT MARS MIGHT HARBOR

SUCH CREATURES.

--> Display at 01:49:01:25
IF THE GROUP CAN FIND LIFE,

--> Display at 01:49:04:05
OR AT LEAST SOME EVIDENCE
THAT LIFE ONCE EXISTED ON MARS,

--> Display at 01:49:07:15
THEN OUR VIEW OF THE UNIVERSE WILL BE CHANGED FOREVER.

--> Display at 01:49:12:04
AND THIS BRINGS US TO OUR FINAL CHARACTERISTIC OF LIFE, DNA.

--> Display at 01:49:16:21
CHILDREN
MAY HAVE HEARD ABOUT DNA

--> Display at 01:49:18:22
BUT ARE LIKELY TO BE JUST
BEGINNING TO BUILD

--> Display at 01:49:21:21
--> Erase at 01:49:23:22
SCIENTIFIC UNDERSTANDINGS
OF IT.

--> Display at 01:49:35:05
Narrator: ONE THING
THAT CHILDREN SEEM TO UNDERSTAND

--> Display at 01:49:37:23
FROM A VERY EARLY AGE

--> Display at 01:49:39:14
IS THAT DIFFERENT TYPES
OF ORGANISMS

--> Display at 01:49:41:09
PRODUCE OFFSPRING
OF THE SAME TYPE.

--> Display at 01:49:46:29
OFFSPRING ARE SAID TO INHERIT TRAITS FROM THEIR PARENTS.

--> Display at 01:49:50:28
BUT WHAT FORM DOES THIS HEREDITARY INFORMATION TAKE?

--> Display at 01:49:54:28
THE ANSWER CAN BE FOUND
BY LOOKING, ONCE AGAIN,

--> Display at 01:49:57:17
AT THE BUILDING BLOCK OF LIFE,
THE CELL.

--> Display at 01:50:00:29
CELLS IN ANY ORGANISM

--> Display at 01:50:02:15
CONTAIN THE INFORMATION
NEEDED TO BUILD THAT ORGANISM.

--> Display at 01:50:07:11
THIS INFORMATION IS FOUND IN STRUCTURES CALLED CHROMOSOMES,

--> Display at 01:50:11:20
WHICH CONTAIN A VERY LONG,
TIGHTLY COILED ORGANIC MOLECULE

--> Display at 01:50:15:25
A NUCLEIC ACID KNOWN
AS DEOXYRIBONUCLEIC ACID,

--> Display at 01:50:21:02
--> Erase at 01:50:23:12
OR DNA, FOR SHORT.

--> Display at 01:50:28:00
EACH MEMBER OF A NEW GENERATION
IS DERIVED FROM A CELL

--> Display at 01:50:31:19
THAT IS FORMED
BY THE PARENT GENERATION.

--> Display at 01:50:34:12
DNA FROM THE PARENT GENERATION IS THUS PASSED TO THE OFFSPRING

--> Display at 01:50:39:02
--> Erase at 01:50:41:17
CARRYING
HEREDITARY INFORMATION WITH IT.

--> Display at 01:50:51:26
Grisham: WE'VE NOW
CONSIDERED CHARACTERISTICS

--> Display at 01:50:54:05
THAT CAN BE USED
TO ANSWER THE QUESTION

--> Display at 01:50:56:07
"WHAT IS LIFE?"

--> Display at 01:50:57:28
IF YOU'RE LOOKING AT AN OBJECT
AND WONDERING

--> Display at 01:51:00:16
WHETHER IT'S LIVING,

DEAD, OR NONLIVING,

--> Display at 01:51:02:29
YOU CAN APPLY THESE CHARACTERISTICS TO FIND OUT.

--> Display at 01:51:06:24
BUT HOW MANY CHARACTERISTICS
ARE ENOUGH

--> Display at 01:51:10:01
IN ORDER FOR SOMETHING
TO BE CONSIDERED ALIVE?

--> Display at 01:51:14:12
CRYSTALS CAN BE SEEN TO GROW,
FOR EXAMPLE.

--> Display at 01:51:17:07
ARE CRYSTALS ALIVE?

--> Display at 01:51:20:03
CLOUDS FORM
IN RESPONSE TO TEMPERATURE

--> Display at 01:51:22:12
AND MOISTURE LEVELS
IN THE SURROUNDING ATMOSPHERE

--> Display at 01:51:25:06
AND MOVE WITH THE WIND --

--> Display at 01:51:26:20
CONDITIONS
IN THE EXTERNAL ENVIRONMENT.

--> Display at 01:51:29:10
ARE CLOUDS ALIVE?

--> Display at 01:51:31:27
A CAR IS MADE OF MATTER
AND USES ENERGY.

--> Display at 01:51:35:06
IS A CAR ALIVE?

--> Display at 01:51:37:14
DEMONSTRATION
OF ONE OR TWO CHARACTERISTICS

--> Display at 01:51:40:17
IS NOT ENOUGH TO
CATEGORIZE SOMETHING AS LIVING.

--> Display at 01:51:43:15
SOMETHING MUST DEMONSTRATE ALL OF THE CHARACTERISTICS OF LIFE,

--> Display at 01:51:46:26
AT LEAST AT SOME POINT
DURING ITS LIFE SPAN,

--> Display at 01:51:49:05
IN ORDER TO BE CONSIDERED ALIVE.

--> Display at 01:51:51:27
LET'S TEST THIS
WITH ONE OF THE OBJECTS

--> Display at 01:51:54:18
THAT THE CHILDREN
IN THE SCIENCE STUDIO

--> Display at 01:51:55:29
--> Erase at 01:51:59:03
WERE PUZZLED BY --
THE DRIED PEA.

--> Display at 01:52:01:22
Grisham: THIS IS
THE WHOLE ADULT PEA PLANT,

--> Display at 01:52:04:01
BEARING MATURE PODS.

--> Display at 01:52:06:21
INSIDE THE PODS ARE PEAS,
FRESH PEAS,

--> Display at 01:52:10:01
LIKE THOSE YOU'D FIND

--> Display at 01:52:11:09
IN A PRODUCE SECTION
IN A SUPERMARKET.

--> Display at 01:52:14:17
DRIED PEAS BEGIN
AS LIVING THINGS.

--> Display at 01:52:17:25
BUT ARE THEY STILL ALIVE?

--> Display at 01:52:20:06
LET'S LOOK FOR
THE CHARACTERISTICS OF LIFE.

--> Display at 01:52:25:07
ARE DRIED PEAS MADE OF CELLS?

--> Display at 01:52:27:17
IT'S ACTUALLY PRETTY DIFFICULT TO SEE IF A DRIED PEA HAS CELLS,

--> Display at 01:52:31:01

BECAUSE ALL OF ITS PARTS SHRINK WHEN THEY DRY.

--> Display at 01:52:34:25
IF YOU PUT ONE IN WATER, HOWEVER, IT SWELLS,

--> Display at 01:52:37:22
AND THE SKIN
CAN BE REMOVED AND EXAMINED

--> Display at 01:52:40:04
WITH THE HELP OF A MICROSCOPE.

--> Display at 01:52:42:09
LET'S LOOK AT THE SKIN.

--> Display at 01:52:45:17
ARE THERE UNITS
THAT LOOK SELF-CONTAINED?

--> Display at 01:52:49:00
WHERE MIGHT
YOU FIND A CELL MEMBRANE?

--> Display at 01:52:52:04
DOES THERE APPEAR TO BE
A NUCLEUS AND CYTOPLASM?

--> Display at 01:52:56:12
--> Erase at 01:52:59:23
DRIED PEAS ARE MADE OF CELLS.

--> Display at 01:53:02:24
WHAT ABOUT LIFE SPAN?

--> Display at 01:53:05:09
YOU'VE SEEN THAT DRIED PEAS

--> Display at 01:53:07:05
ARE PRODUCED
BY AN ADULT PEA PLANT.

--> Display at 01:53:09:16
AND THUS THEY HAVE
A LIVING BEGINNING

--> Display at 01:53:11:15
AND ARE ACTUALLY SEEDS.

--> Display at 01:53:13:20
YOU CAN SEE
THE REMAINS OF A DRIED PEA

--> Display at 01:53:16:13
AT THE BASE OF THIS ADULT PLANT.

--> Display at 01:53:18:25

THIS ONE SPROUTED
INTO A PLANT THAT GREW,

--> Display at 01:53:22:02
DEVELOPED, AND REPRODUCED.

--> Display at 01:53:24:20
DRIED PEAS REPRESENT
THE FIRST STAGE

--> Display at 01:53:27:11
IN THE LIFE SPAN OF A PEA PLANT.

--> Display at 01:53:31:20
HOW ABOUT MATTER AND ENERGY?

--> Display at 01:53:33:11
IF WE LOOK AT
THE LIST OF INGREDIENTS

--> Display at 01:53:35:08
ON A PACKAGE OF DRIED PEAS
WE CAN SEE THAT THEY CONTAIN

--> Display at 01:53:38:15
FATS, CARBOHYDRATES,
AND PROTEINS --

--> Display at 01:53:41:26
ALL OF THESE
ARE ORGANIC MOLECULES.

--> Display at 01:53:44:21
THEY ARE THUS MADE OF MATTER

--> Display at 01:53:46:20
THAT IS CHARACTERISTIC
OF THE LIVING WORLD.

--> Display at 01:53:49:25
DO DRIED PEAS CONSTANTLY OBTAIN
AND USE MATTER AND ENERGY?

--> Display at 01:53:55:29
LIFE PROCESSES
THAT REQUIRE MATTER AND ENERGY

--> Display at 01:53:59:01
ACTUALLY DO OCCUR
WITHIN A DRIED PEA

--> Display at 01:54:01:21
AT A LEVEL IMPERCEPTIBLE TO US.

--> Display at 01:54:04:17
THESE PROCESSES KEEP IT ALIVE

--> Display at 01:54:06:25
--> Erase at 01:54:10:02
SO THAT IT CAN SPROUT
AND BEGIN A NEW LIFE.

--> Display at 01:54:12:01
SO FAR, OUR DRIED PEAS ARE
HOLDING UP WELL UNDER SCRUTINY

--> Display at 01:54:16:12
--> Erase at 01:54:18:06
FOR THE CHARACTERISTICS OF LIFE.

--> Display at 01:54:20:19
DO THEY RESPOND
TO THEIR ENVIRONMENT?

--> Display at 01:54:24:00
THE ADULT PLANT RESULTED
FROM THE DRIED PEA

--> Display at 01:54:26:19
YOU SEE AT ITS BASE.

--> Display at 01:54:28:14
WITH THE ADDITION OF WATER,

--> Display at 01:54:30:01
THIS PEA SWELLED
AND EVENTUALLY SPROUTED.

--> Display at 01:54:33:18
SPROUTING IS A RESPONSE

--> Display at 01:54:35:16
--> Erase at 01:54:38:07
TO A CHANGE
IN THE EXTERNAL ENVIRONMENT.

--> Display at 01:54:40:04
THE FINAL CHARACTERISTIC OF LIFE
THAT MUST BE PRESENT

--> Display at 01:54:42:28
IN ORDER FOR A DRIED PEA
TO BE CONSIDERED ALIVE IS DNA.

--> Display at 01:54:47:17
AS YOU'VE SEEN,
DRIED PEAS ARE SEEDS

--> Display at 01:54:50:07
THAT ARE FORMED
BY AN ADULT PEA PLANT.

--> Display at 01:54:52:22
AT THE TIME OF THEIR FORMATION

--> Display at 01:54:54:16
DNA IS PASSED
FROM PARENT TO OFFSPRING,

--> Display at 01:54:57:11
THUS ENSURING
THAT THE NEW GENERATION

--> Display at 01:54:59:29
--> Erase at 01:55:03:11
WILL INDEED BE PEA PLANTS.

--> Display at 01:55:10:18
Grisham:
OF THE FIVE CHARACTERISTICS

--> Display at 01:55:12:16
WE HAVE USED TO DEFINE LIFE,

--> Display at 01:55:14:18
SOME ARE EVIDENT
IN THE UNDERSTANDINGS

--> Display at 01:55:16:17
CHILDREN BRING TO THE CLASSROOM.

--> Display at 01:55:18:29
OTHERS, LIKE DNA,

--> Display at 01:55:21:00
MAY NOT BE PART
OF THEIR EVERYDAY EXPERIENCE.

--> Display at 01:55:25:19
SO THE FIVE CHARACTERISTICS
WE HAVE USED

--> Display at 01:55:27:20
ARE A USEFUL STARTING POINT
WHEN CONSIDERING "WHAT IS LIFE."

--> Display at 01:55:33:26
DURING THIS SESSION
WE LOOKED AT CHARACTERISTICS

--> Display at 01:55:36:12
SHARED BY
ALL LIVING THINGS.

--> Display at 01:55:39:02
YET THERE ARE NEARLY 1.5 MILLION NAMED SPECIES ON EARTH.

--> Display at 01:55:43:01

AND SOME SCIENTISTS
THINK THAT

--> Display at 01:55:44:29
THERE MAY BE UP TO
100 MILLION SPECIES.

--> Display at 01:55:47:29
HOW DO SCIENTISTS
TELL THEM APART

--> Display at 01:55:50:23
AND HOW CAN WE MAKE SENSE
OF THE LIVING WORLD?

--> Display at 01:55:54:09
WELL, IN OUR
NEXT SESSION TOGETHER,

--> Display at 01:55:56:23
WE WILL EXPLORE
THE QUESTION --

--> Display at 01:55:58:15
"ANIMAL, VEGETABLE,
OR OTHER?"

--> Display at 01:56:02:09
THANKS FOR BEING WITH US.

--> Display at 01:56:03:27
--> Erase at 01:56:06:11
SEE YOU NEXT TIME.

--> Display at 01:58:01:03
*FUNDING FOR THIS PROGRAM
IS PROVIDED BY ANNENBERG/CPB*

--> Display at 01:58:04:26
--> Erase at 01:58:07:11
TO ADVANCE EXCELLENT TEACHING.

--> Display at 01:58:11:02
FOR INFORMATION ABOUT THIS

--> Display at 01:58:12:24
*AND OTHER
ANNENBERG/CPB PROGRAMS,*

--> Display at 01:58:15:08
CALL 1-800-LEARNER

--> Display at 01:58:17:17
--> Erase at 01:58:21:09
AND VISIT US AT www.learner.org.

--> Display at 01:58:24:24