

# Dan Rather Reports

**Episode Number:** 313

**Episode Title:** Mind Science

**Episode Description:** Scientists, with the help of Buddhist monks and the Dalai Lama, are unlocking mysteries of the brain.

DAN RATHER (VOICE OVER)

TONIGHT... HOW YOU CAN CHANGE YOUR BRAIN... AND HOW THE DISCOVERY OF THE BRAIN'S AMAZING ABILITY TO RE-WIRE ITSELF IS GIVING RESEARCHERS NEW HOPE FOR TREATING DISEASE AND FOR IMPROVING LIFE AS WE AGE. IT'S CALLED NEURO-PLASTICITY: SIMPLY PUT—IT'S THE BRAIN'S NEVER-ENDING ABILITY TO CHANGE.

DR. ERIC KANDEL

It is without doubt the last frontier ...

RATHER (VOICE OVER)

WE'LL VISIT NOBEL PRIZE WINNER DR. ERIC KANDEL WHO DISCOVERED HOW THE BRAIN CHANGES TO STORE MEMORIES.

KANDEL

To understand how you work. To understand how the inner parts of your psyche operate. It's fantastic.

RATHER (VOICE OVER)

WE'LL SHOW YOU STROKE PATIENTS LEARNING TO USE DISABLED LIMBS BY RE-TRAINING THEIR BRAINS—

GORDON BANKS

The brain is not as stiff as you think it is. There is room for pushing it around a bit so things will improve.

RATHER (VOICE OVER)

WE'LL LEARN ABOUT BRAIN FITNESS PROGRAMS THAT MAY MAKE AGING A WHOLE LOT EASIER...

MARLENE ALLEN

People spend more time at the gym or exercising. They're forgetting that one of the most important parts is your brain that you need to exercise

RATHER (VOICE OVER)

AND MOST ASTONISHING OF ALL... WE'LL SHOW YOU HOW THE DISCOVERY OF NEUROPLASTICITY IS UNRAVELING THE CONNECTION BETWEEN THE BRAIN AND THE MIND WITH THE HELP OF BUDDHIST MONKS AND THE DALAI LAMA HIMSELF.

RATHER (ON CAMERA)

GOOD EVENING FROM DHARAMSALA, INDIA. HOME TO ONE OF THE WORLD'S MOST REVERED SPIRITUAL AND PHILOSOPHICAL LEADERS... HIS HOLINESS, THE FOURTEENTH DALAI LAMA. MANY PEOPLE COME HERE FOR PILGRIMAGES AND SPIRITUAL QUESTS... BUT WE'RE HERE TO EXPLORE A WHOLE NEW WORLD OF SCIENCE. IT'S CALLED NEUROPLASTICITY. AND IT'S THE STUDY OF WHAT WE NOW KNOW TO BE THE BRAIN'S EXTRAORDINARY ABILITY TO CHANGE, TO GROW, TO EVEN REWIRE ITSELF. AND WE'RE ALSO HERE BECAUSE THE DALAI LAMA AND THE BUDDHIST MONKS AND LAMAS WHO DEVOTE THEMSELVES RIGOROUSLY TO MEDITATION TRAINING NOW FIND THEMSELVES ON THE FOREFRONT OF ADVANCED RESEARCH TO FIND THE CONNECTION BETWEEN THE MIND AND THE BRAIN.

RATHER (VOICE OVER)

THEY ARE THE KEEPERS OF THE ANCIENT BUT STILL EVOLVING PRACTICE OF TIBETAN BUDDHISM. THEY BEGIN AS SMALL CHILDREN ... MEMORIZING AND TRAINING THEIR MINDS FOR A LIFE TIME OF DEVOTION. LOOKING INWARD BECOMES A WAY OF LIFE ... AND MEDITATION IS ONE TOOL IN THEIR QUEST FOR ENLIGHTENMENT. AND NOW THIS 2500 YEAR OLD PRACTICE IS OFFERING MODERN NEUROSCIENCE A PATH TO UNDERSTANDING HOW OUR BRAINS CAN CHANGE THROUGHOUT LIFE. IT'S A PHENOMENON CALLED NEUROPLASTICITY AND IT'S TURNED BRAIN SCIENCE ON ITS HEAD.

RATHER (VOICE OVER)

THIRTY THREE YEAR OLD YONGEY MINGYUR RINPOCHE AN ESTEEMED TEACHER OF TIBETAN BUDDHISM IS ON HIS THIRD VISIT TO THE UNIVERSITY OF WISCONSIN'S WAISMAN LABORATORY FOR BRAIN IMAGING AND BEHAVIOR.

RATHER (VOICE OVER)

FOR THE PAST FIVE YEARS... BUDDHIST MONKS WITH TENS OF THOUSANDS OF HOURS OF MEDITATION TRAINING HAVE VOLUNTEERED THEIR BRAINS FOR SCIENTIFIC STUDY.

ANTOINE LUTZ, UNIVERSITY OF WISCONSIN

Spending time with them is very inspiring because they are always very happy, very funny also.

RATHER (VOICE OVER)

NEUROSCIENTIST ANTOINE LUTZ IS PART OF A TEAM OF RESEARCHERS TRYING TO UNDERSTAND HOW THE MONKS' MENTAL TRAINING CHANGES THE BRAIN.

LUTZ

We think that someone who is trained to practice compassion ... they are somehow going to change their brain through this practice. So we are interested to see how far can you transform your mind? And how far that the brain can change.

RATHER (VOICE OVER)

SEEING HOW PHYSICAL TRAINING OR EXPERIENCE ALTERED BRAIN CIRCUITS ... THE TEAM AT THE UNIVERSITY OF WISCONSIN WANTED TO KNOW IF MENTAL TRAINING LIKE MEDITATION COULD CHANGE A REGION IN THE BRAIN THAT MANAGES EMOTIONS.

LUTZ

We think, that what meditation does is ... training this region to react differently.

RATHER (VOICE OVER)

ON THIS VISIT TO THE LAB ... LUTZ ASKED MINGYUR RINPOCHE TO USE HIS POWERS OF CONCENTRATION AND ATTENTION TO FOCUS ON COMPASSION... A TRADITIONAL BUDDHIST MEDITATION PRACTICE. THIS GIVES THE SCIENTISTS A GLIMPSE INTO THE INNER WORKINGS OF A BRAIN THAT HAS BEEN TRAINED TO ENTER INTENSE EMOTIONAL STATES.

LUTZ

So what you see here is the EEG across 20 seconds when Mingyur Rinpoche was just staying at rest, doing nothing and, you know, normal states. At this particular moment we ask him to start to meditate on compassion. And what you see is that there is a very strong increase in the speed of the oscillations while he start to meditate.

RATHER (VOICE OVER)

WHAT MINGYUR RINPOCHE'S BRAIN IS DOING IS CALLED GAMMA ACTIVITY...ALL BRAINS DO IT BUT VERY RARELY AT THIS LEVEL. THE FACT THAT THE MONK'S BRAINS REMAIN IN THIS STATE-- EVEN AFTER THEY STOP MEDITATING-- IS AN EXAMPLE OF NEURO-PLASTIC CHANGE.

LUTZ

...that for us is an indication that through the training something happened in the brain. And something have changed in such a way that they can generate this very, very integrative and coherent states during meditation.

RATHER (VOICE OVER)

THIS TRANSFORMATION OF BRAIN ACTIVITY EQUALS WHAT THE MONKS DESCRIBE AS A STATE OF CLARITY AND INTENSE COMPASSION FOR OTHER BEINGS.

LUTZ

It is our hope that by collaborating with experts like Mingyur Rinpoche we can maybe better understand what is consciousness in relation to the brain.

YONGEY MINGYUR RINPOCHE, BUDDHIST TEACHER

There's many, many parallels between the modern science and Buddhism view.

RATHER (VOICE OVER)

FOR MINGYUR RINPOCHE COLLABORATING WITH LUTZ HAS SHOWN HIM HOW HIS THINKING ... HIS MEDITATION PRACTICE... ACTUALLY TRANSFORMS THE BRAIN.

RINPOCHE

If you apply meditation every day a little bit then you change the habit of the brain function.

RICHARD DAVIDSON, UNIVERSITY OF WISCONSIN

The brain changes in a kind of haphazard way, if you will, without that kind of systematic input or training.

RATHER (VOICE OVER)

PROFESSOR RICHARD DAVIDSON IS THE DIRECTOR OF THE WAISMAN CENTER AND PRINCIPAL AUTHOR OF THE MEDITATION STUDIES.

DAVIDSON

We are exposed to all kinds of influences in our environment all the time. Those influences are affecting our brain, they are changing our brain. If we are better able to regulate those inputs and to engage in specific kinds of training to cultivate positive qualities of mind, we can, I think, based on modern neuroscience evidence, we can change our brains by transforming our minds in beneficial ways.

RATHER (VOICE OVER)

DAVIDSON HAS PUBLISHED DOZENS OF NEURO-SCIENTIFIC STUDIES ON EMOTIONAL DISORDERS AND BRAIN STRUCTURE ...BUT IT WAS HIS PERSONAL INTEREST IN MEDITATION THAT MADE HIM PURSUE A NEW LINE OF RESEARCH...

DAVIDSON

The brain is constantly changing, it's changing all the time and the question is: How can we change it for the better?

RATHER (VOICE OVER)

TO FIND OUT HOW EMOTIONS MIGHT BE MANAGED USING THE BRAIN'S PLASTICITY... DAVIDSON TURNED TO ONE OF THE WORLD'S EXPERTS ON TRAINING THE MIND... HIS HOLINESS THE FOURTEENTH DALAI LAMA.

RATHER (VOICE OVER)

THE DALAI LAMA HAS A KEEN INTEREST IN SCIENCE AND HE REGULARLY PARTICIPATES IN MEETINGS OF THE MIND AND LIFE INSTITUTE... THAT'S AN ORGANIZATION FOUNDED TO CONNECT WESTERN SCIENTIFIC RESEARCH WITH BUDDHIST INTERESTS IN MENTAL TRAINING.

DAVIDSON

There's no reason why we couldn't use the exquisite precision of science which we've directed to studying states like fear and anxiety and bring them to study compassion.

RATHER (VOICE OVER)

DAVIDSON BEGAN HIS ON-GOING CONVERSATIONS WITH THE DALAI LAMA SIXTEEN YEARS AGO...

DAVIDSON

It was at that meeting in 1992 that I made a commitment to him, as well as to myself, that I was going to now come out of the closet so to speak with my interests in meditation.

RATHER (VOICE OVER)

HEARING A SCIENTIST MENTION MEDITATION MATCHED THE DALAI LAMA'S GROWING AWARENESS OF THE DISCOVERY OF NEUROPLASTICITY.

RATHER (ON CAMERA)

WITH HIS LIFE-LONG CURIOSITY ABOUT SCIENCE AND A BUDDHIST PHILOSOPHY CENTERED ON TRAINING THE MIND, THE DALAI LAMA TOOK NOTICE OF WHAT WAS THEN THIS NEW SCIENCE TWENTY YEARS AGO. HE INVITED A GROUP OF SCIENTISTS HERE TO HIS HOME IN EXILE TO TALK ABOUT IT AND FROM THAT FIRST MEETING GREW A REGULAR INTERCHANGE BETWEEN BUDDHISM AND BRAIN SCIENTISTS.

Mind and Life 2004, DAVIDSON

We will be discussing neuroplasticity which refers to the brain's capacity to change.

RATHER (VOICE OVER)

AT A MIND AND LIFE MEETING AT THE DALAI LAMA'S HOME IN DHARAMSALA IN 2004 DAVIDSON PRESENTED THE PAPER THAT PUT MEDITATION STUDIES INTO THE MAINSTREAM.

SHARON BEGLEY, NEWSWEEK

Richie Davidson's studies have now been published in the most respected science journals. And I would certainly say that even five years ago that would have been a tough slog.

RATHER (VOICE OVER)

NEWSWEEK SENIOR EDITOR SHARON BEGLEY HAD BEEN FOLLOWING THE BREAKTHROUGHS IN NEUROPLASTICITY RESEARCH FOR SEVERAL YEARS WHEN SHE MANAGED AN INVITATION TO THE MEETING IN DHARAMSALA.

RATHER

Was it all strange, or surprising to you that the scientists and the Dalai Lama would get along this well?

BEGLEY

They were both hoping to get something from the other. The Dalai Lama was interested in establishing Buddhism as a modern faith, one that is open to science. The scientists, for their part, need the Buddhist scholars to volunteer for their experiments. They need the Buddhist scholars who have 10,000 hours of meditation under their robes, as it were, to come into the labs and to lay down in the FMRI machine and have their brains scanned.

RATHER (VOICE OVER)

THE MONKS WHO COME TO DAVIDSON'S LAB ARE WILLING TO SPEND HOURS IN THE TUBES OF THE GIANT F-M-R-I MACHINES...AT THE DIRECT REQUEST OF THE DALAI LAMA HIMSELF.

BEGLEY

He encourages the monks, the Lamas, the other Buddhist scholars around him to volunteer their brains for this neuroscience research and specifically what he's interested in learning is whether mental training, which in Buddhism, of course, takes the form of meditation, can act back on the brain to produce structural and functional changes.

RATHER

Can it?

BEGLEY

He believes it does. Buddhist philosophy says it does. And the emerging research, indeed, shows that it can.

RATHER (VOICE OVER)

PULLING TOGETHER WHAT SHE FOUND IN DHARAMSALA AND DECADES OF BRAIN SCIENCE RESEARCH BEGLEY WROTE THE BOOK ON THE NEW DISCOVERY THAT OUR MINDS—OUR THINKING—CAN CHANGE OUR BRAINS.

RATHER

Your book is titled Train Your Mind, Change Your Brain. Is that really possible?

BEGLEY

I think it is possible, and by training your mind, what I mean is if you choose to engage in meditation, then the research emanating from Richie Davidson's lab at Wisconsin does show that you can achieve things such as, for instance switching activity in the region just behind your forehead meditation can indeed cause that shift. It can cause you to shift activity towards the left side, which again, correlated with contentment.

RATHER (VOICE OVER)

THAT ACTIVITY – A NEUROPLASTIC CHANGE--WAS INVISIBLE UNTIL THE DEVELOPMENT OF THE RELATIVELY NEW HIGH TECH TOOLS OF NEUROSCIENCE. UNTIL THEY COULD SEE THE FUNCTIONS OF A LIVING BRAIN SCIENTISTS WERE CONVINCED THE BRAIN STOPPED DEVELOPING IN EARLY CHILDHOOD. BUT THE MORE THEY LOOKED, THE MORE A NEW PICTURE EMERGED. THEY BEGAN TO SEE HOW THE MIND ACTS BACK ON THE BRAIN. AND USING THOSE TOOLS DAVIDSON IS EVEN LOOKING AT HOW MEDITATION MIGHT ALTER THE CIRCUITS THAT CONTROL OUR BASIC LEVEL OF HAPPINESS.

DAVIDSON

The brain mechanisms that are associated with happiness are themselves changeable. They are among the most plastic circuits in the brain that are transformable through experience.

RATHER (VOICE OVER)

WITH EVIDENCE THAT MEDITATION WAS CHANGING THE CIRCUITS IN THE PART OF THE BRAIN ASSOCIATED WITH CONTENTMENT AND HAPPINESS IN MONKS... DAVIDSON EXTENDED HIS RESEARCH TO PEOPLE WHO HAD ONLY A BRIEF EIGHT WEEK TRAINING IN A FORM OF MEDITATION DESIGNED TO DECREASE NEGATIVE EMOTIONS AND CULTIVATE THE POSITIVE.

DAVIDSON

People like you and I, ordinary middle class Americans underwent this training. They showed a reliable change in their brain activity over the course of this two-month period.

RATHER (VOICE OVER)



IT IS MORE SCIENTIFIC EVIDENCE THAT DAVIDSON SAYS HOLDS OUT THE PROMISE THAT THE POWERS OF NEUROPLASTICITY COULD MEAN -- AS THE OLD SAYING GOES -- THAT WE CAN BE AS HAPPY AS WE MAKE UP OUR MINDS TO BE.

DAVIDSON

We shouldn't think of these as fixed characteristics of people. If we take the initiative, if we take responsibility for our own minds, we can produce more positive individuals who have more of these beneficial qualities, which in turn, I think, will have a synergistic effect in making our culture-- and our society a more positive one.

RATHER (VOICE OVER)

FINDING OUT IF THERE IS HARD EVIDENCE THAT MEDITATION BRINGS REAL CHANGE IN PEOPLE'S LIVES IS AT THE HEART OF THE DALAI LAMA'S INTEREST IN THIS NEW SCIENCE.

RATHER

Your Holiness, I very much appreciate you doing this. Thank you. Let's talk science.

RATHER (VOICE OVER)

WE SPENT AN HOUR WITH THE DALAI LAMA AT HIS HOME IN DHARAMSALA, EXPLORING HIS FASCINATION WITH THE SCIENCE OF THE MIND.

HIS HOLINESS, THE DALAI LAMA

Particularly I feel in medical science now showing I think genuine eagerness to tackle our emotions. How to develop some of these useful emotions, and how to reduce negative emotions such as fear, anger like that.

RATHER

Is the definition of what you're trying to do is find the connection between the mind and the brain?

DALAI LAMA

I think from my viewpoint, my expectation through experiment or through investigation, we will find certain how to say way to tackle our destructive emotion and try to reduce this negative emotion and increase positive emotion.

RATHER (VOICE OVER)

THE DALAI LAMA SAYS HIS OWN MEDITATION PRACTICE HAS BROUGHT HIM A SENSE OF WELL-BEING AND A REDUCTION IN THE NEGATIVE EMOTIONS THAT MOST PEOPLE ASSUME ARE AN UNCHANGEABLE PART OF LIFE.

DALAI LAMA

Usually you see, we consider every emotion as just part of our life, part of our mind. For example, fear or hatred as it comes we just usually consider normal. I think that's a mistake.

RATHER (VOICE OVER)

HE SEES THE STUDIES COMING FROM LABS LIKE RICHARD DAVIDSON'S BACKING UP HIS OWN PERSONAL EXPERIENCE.

DALAI LAMA

Now one example you see, when we feel certain sort of irritation during that moment if that person concentrate fully on the breathing, nothing else and breathing 1, 2, 3, like 5, 10, 15, 20. When you start breathing mental state irritated. But then after 20, 30 breathing your mental state will be little different. Little more calm. Since we are dealing with emotions. So the best method to deal with that is through the so-called meditation. Not for next life not for heaven, but for day-to-day's well-being.

RATHER (VOICE OVER)

AND THAT—THE ABILITY TO TRIGGER CHANGE THAT IMPROVES LIFE—IS WHY THE DALAI LAMA CONTINUES TO ENCOURAGE MONKS TO PARTICIPATE IN SCIENTIFIC RESEARCH. HE SAYS HE MIGHT EVEN CONSIDER PARTICIPATING HIMSELF ONE DAY.

RATHER

Some of the monks and Lamas took part in the scientific research. Did you consider taking part, submitting yourself to that kind of examination?

DALAI LAMA

Some cases in the past, this is how my friend, he say want to check. Wants to, wants to carry experiment on my brain. Actually, I have no special sort of experience. And so, I was telling them worthless, taking experiment on my mind. Is nothing special because you see, no sufficient time to meditate. So hopefully I will get more time to meditate. Then when I have some special sort of experience, you see, develop then I'm ready.

BEGLEY

I would also hope that just as the Dalai Lama's interest in this work relates to his hope that we can become a more compassionate species, that we will find ways to increase activity in those regions of the brain that underlie compassion and altruism. You know, we all have it in us. Many of us lose it at some point in our lives. But it's there. And it has a basis in the brain. And the challenge is to find it and to use it in a way that will you know, produce a better world.

RATHER (VOICE OVER)

COMING UP NEXT: REAL-LIFE SUCCESS STORIES IN NEURO-PLASTICITY FROM RE-TRAINING THE BRAIN TO RECOVER AFTER A STROKE TO IMPROVING MEMORY AND LEARNING NEW SKILLS AS WE AGE.

MARLENE ALLEN

They were saying-- for so long, "Oh well, you can't change it. Once you have your brain, you know that-- and it deteriorates with age, you've had it." Well, I didn't like that idea.

JOE HARDY, POSIT SCIENCE

I find this to be a very good exercise in terms of just improving your clarity, I mean in terms of your focus.

RATHER (VOICE OVER)

JOE HARDY IS TRYING TO FIND A WAY TO TRAIN HIS BRAIN TO SPEED UP ITS SOUND AND VISION PROCESSING ... USING BEEPS...MEMORY GAMES...AND STORY-TELLING. AS THE DIRECTOR OF RESEARCH AT A COMPANY CALLED POSIT SCIENCE, HARDY AND COMPANY FOUNDER MICHAEL MERZENICH BELIEVE THEIR COMPUTER EXERCISES WILL MAKE YOUR BRAIN ACT YOUNGER.

HARDY

Previous to maybe twenty years ago we thought that the brain essentially stopped developing. Your brain was fixed and there was nothing that could be done with it, essentially you can't teach an old dog new tricks.

RATHER (VOICE OVER)

FOR DECADES NEUROSCIENTISTS BELIEVED BRAIN CELLS GREW AND DEVELOPED FOR ONLY THE FIRST FEW YEARS OF LIFE MAKING AGING A HOPELESS DOWNWARD SPIRAL AS NEURONS DIED OFF AND LOST CONNECTIONS.

MICHAEL MERZENICH, POSIT SCIENCE

Basically what we now understand is, is that is all wrong and what's, actually what the machine is doing is it's changing itself, it's modifying itself.

RATHER (VOICE OVER)

MERZENICH IS A PIONEER IN BRAIN PLASTICITY RESEARCH AND A PROFESSOR OF NEUROSCIENCE AT THE UNIVERSITY OF CALIFORNIA, SAN FRANCISCO. HE FOUNDED HIS NEWEST COMPANY TO APPLY HIS MANY DISCOVERIES TO AGING BRAINS. MERZENICH'S COMPUTER PROGRAMS AREN'T DESIGNED TO IMPROVE WHAT THE EAR HEARS OR THE EYE SEES BUT TO SPEED UP THE WAY THE BRAIN PROCESSES SOUNDS AND SIGHTS.

HARDY

It has a level that's easy enough for everyone to do it, and it's got a level that's so hard and challenging that really no one can do it.

RATHER (VOICE OVER)

THESE SCIENTISTS BELIEVE THE GAME-LIKE PROGRAMS WILL TRIGGER CHANGES IN SPECIFIC REGIONS OF THE BRAIN BUT ONLY WITH PRACTICE.

MERZENICH

The brain is a learning machine. It wants new learning. And it's actually begging for it.

RATHER (VOICE OVER)

BRAIN FUNCTIONS SLOW DOWN WITH AGE. AND MERZENICH LIKE MANY OTHER SCIENTISTS WANTS TO FIND OUT HOW.

MERZENICH

One of the problems is-- is that doing exactly the right thing is not instinctive. You almost have to go the brain gym, you know? You almost have to, you almost have to have help or instruction in in figuring out exactly what it is you need to improve these most critical of faculties.

RATHER (VOICE OVER)

IN THE ONLY PUBLISHED STUDY OF THE POSIT SCIENCE PROGRAM, FIVE HUNDRED AND TWENTY FOUR PEOPLE FROM AGE 65 TO 93 USED HIS BRAIN FITNESS PROGRAM ONE HOUR A DAY FOR EIGHT TO TEN WEEKS.

THEIR SPEED OF PROCESSING SOUNDS DOUBLED AND MANY OF THEM REPORTED THAT THEIR MEMORIES IMPROVED. FOR MERZENICH IT'S MORE EVIDENCE THAT A BRAIN THAT PROCESSES SOUNDS FASTER BECOMES A YOUNGER - ACTING BRAIN AND ONE THAT MIGHT PROMPT NEW BEHAVIOR.

MERZENICH

You know, another thing that people do that relates to this is they seek a comfortable older life. A life that's full of the familiar, that's full of things they're already good at, right? All of things basically constitute a strategy to neglect the machinery of the brain that keeps you really alive.

RATHER (VOICE OVER)

RETIRED SCHOOL TEACHER MARLENE ALLEN JUMPED AT THE CHANCE TO SIGN UP FOR MERZENICH'S STUDY AND PUT HER BRAIN TO THE TEST.

MARLENE ALLEN, BRAIN STUDY VOLUNTEER

They were saying for so long, "Oh well, you can't change it. Once you have your brain, you know, that then it deteriorates with age, you've had it." Well, I didn't like that idea.

RATHER (VOICE OVER)

FOR MARLENE AND HER HUSBAND BOB SITTING STILL IS UNTHINKABLE.

MARLENE ALLEN

I wanted to be productive and useful and have fun. You can't have fun if you're old and you're sitting in a chair.

RATHER (VOICE OVER)

NOW IN THEIR SEVENTIES THEY ARE ALWAYS BUSY KEEPING THEIR BOAT READY TO SAIL OUT ONTO SAN FRANCISCO BAY FROM THEIR MARIN COUNTY HOME. THE BOAT IS A PHYSICAL CHALLENGE THAT KEEPS BOTH ALLENS IN SHAPE.

RATHER (VOICE OVER)

AND MARLENE BELIEVES THE BRAIN FITNESS PROGRAM GIVES HER A MENTAL WORK OUT THAT'S WELL WORTH ITS \$400 PRICE TAG.

ALLEN

It's challenging. It may look easy but they're going to up the challenge. And as you do well, they'll up it some more, so that you're going to be challenged more and more.

RATHER (VOICE OVER)

AS THOSE RISING AND FALLING BEEPS SPEED UP...SO DOES THE BRAIN'S ABILITY TO PROCESS THAT SOUND.

ALLEN

Toward the end of the study, it was going, "Whoop. Whoop. Whoop. Whoop." It was so, it was so fast that you could hardly hear it. But that was exciting to me to be able to do that.

RATHER (VOICE OVER)

LIKE THE EVIDENCE THAT SOMETHING IS CHANGING IN THE BUDDHIST MONKS' BRAINS WHEN THEY MEDITATE, MARLENE ALLEN SAYS SHE SEES SIGNS THAT THE BRAIN RESPONDS AND CHANGES WHEN IT'S DOING SOMETHING NEW.

ALLEN

It's targeting my brain and opening it's almost like a door bell I know that sounds silly but it when you ring the door bell you're stimulating you know this brain part and it you open the door and there's so much in there and I love it, I just love it. Cause I can think better, I can think more clearly. I don't want to be, have dementia or, or any of these kinds of things. And if there's anything I can do to change that, I will work hard on it.

RATHER (VOICE OVER)

THE POSIT SCIENCE PROGRAM TAKES 35 TO 40 HOURS OVER THREE MONTHS ... AND ITS PRICE TAG IS MORE THAN MANY OTHER BRAIN TRAINING PRODUCTS ADVERTISED ALL OVER THE INTERNET. TURN ON YOUR OWN COMPUTER AND TYPE IN NEUROPLASTICITY... AND YOU'LL BE OVERWHELMED WITH OFFERS TO IMPROVE YOUR BRAIN POWER. WHILE MERZENICH HAS THE DATA TO SHOW OLDER BRAINS CAN CHANGE... EVEN HE IS SKEPTICAL ABOUT THE CLAIMS THAT THE BRAIN'S AGING PROCESS CAN BE SOMEHOW REVERSED.

MERZENICH

If you believed half of the claims that are made about various things that you could do to improve your brain by, by playing games, training this, doing this kind of puzzle,

whatever, then none of us would have any problem and we'd all live to be 120 or 50 already in a very fine fettle, but it's just not true.

RATHER (VOICE OVER)

DISCOVERING WHAT REALLY WORKS FOR BRAIN TRAINING STARTS IN THE LABORATORY. AND ONE OF THE FIRST TO SEE HOW BRAIN CELLS CHANGE TO STORE MEMORIES WAS DR. ERIC KANDEL OF NEW YORK'S COLUMBIA UNIVERSITY.

RATHER (VOICE OVER)

AT 77 DR. KANDEL IS AN AVID SWIMMER, A TENNIS PLAYER, A PSYCHIATRIST AND A NEUROBIOLOGIST. HE WON THE NOBEL PRIZE IN MEDICINE IN 2000 FOR HIS DISCOVERIES ABOUT MEMORY AND NEUROPLASTICITY.

DR. ERIC KANDEL, COLUMBIA UNIVERSITY

If we carry on a conversation, or we have a pleasant afternoon together, and you and I remember that tomorrow, or a week from now, it's because our brain has been modified as a result of that experience. The way nerve cells talk to one another has been altered so we recall that.

RATHER (VOICE OVER)

STORING MEMORIES IS ANOTHER OF THE BRAIN'S PLASTIC ABILITIES.

KANDEL

When one neuron talks to another, they talk with a certain tone of voice. As the memory becomes stronger, the tone of voice becomes louder.

RATHER (VOICE OVER)

THAT STRENGTHENING OF COMMUNICATION BETWEEN CELLS IS THE BASIS OF SHORT TERM MEMORY—A CHANGE THAT DOESN'T NECESSARILY LAST.

RATHER

How does the brain change and grow?

KANDEL

When one learns something, signals are sent into the brain that activate modulatory pathways that cause the connections between nerve cells to change in function. If you remember something very briefly, like a telephone number, or something that happens casually, you remember it for five or ten minutes, it's a functional change that regresses back to its previous state.

RATHER (VOICE OVER)

WHAT DR. KANDEL DISCOVERED IS THAT LONG TERM MEMORIES AREN'T STORED IN THE CONNECTIONS BETWEEN CELLS... BUT INSIDE EACH CELL... IN THE WAY GENES EXPRESS THEMSELVES.

KANDEL

If something is very important for you like meeting Dan Rathers, or having an opportunity to do something interesting you remember it for longer periods of time. Or if you repeat something many times, you learn it for a long time. That actually gives rise to anatomical changes. So you have a different anatomy. So that means that every single person has a slightly different brain than every other person. Identical twins with identical genes have somewhat different brains because they will have different life experiences. And one of the interesting things about how you grow those connections is that the signals that are sent to nerve cells to grow new connections alter the expressions of genes in the brain.

RATHER (VOICE OVER)

SO JUST LIKE HEARING...AND VISION... THE BRAIN'S ABILITY TO CHANGE ITSELF AT EVERY LEVEL MEANS IT CAN GET BETTER AT REMEMBERING. BUT THERE'S NO DOUBT IT'S ANOTHER SKILL THAT GETS MORE DIFFICULT AS WE AGE.

RATHER

When a person gets to be a certain age, and begins to have some memory problems fairly quickly now people say, "Well it's early Alzheimer's."

KANDEL

No.

RATHER

But-- no.



KANDEL

Alzheimer's Disease is a quite rapidly progressing disorder. So it gets progressively worse and after while language is impaired, thinking is seriously impaired. Non-Alzheimer age-related memory loss is unpleasant. It's forgetting where you put your keys. Where you park your car, people's names.

RATHER

So if grandfather forgets his car keys, or can't remember the name of a person at the dinner party, but gets back home and say, "You know, I don't know why I didn't think of it. I know that guy's name now."

KANDEL

That's fine. People have to become comfortable with the fact that the brain ages like your muscles age. If you miss a backhand that you made when you were 17, you're upset. But you're not, you understand it. The same is true for the brain although we don't have rigorous evidence, there's reason to believe that you could help that.

RATHER (VOICE OVER)

JUST AS MICHAEL MERZENICH PUSHES THE BRAIN TO MANAGE SOUND BETTER... DR. KANDEL BELIEVES SCIENCE WILL EVENTUALLY SHOW THAT MEMORY ALSO IMPROVES WHEN CHALLENGED.

RATHER

Does-- working crosswords puzzles and playing bridge—

KANDEL

Excellent.

RATHER

--help you keep your memory?

KANDEL

Absolutely. Absolutely.

RATHER

Or learn a new language?

KANDEL

Learn a new language. Some new thing. I mean, bridge is a very demanding game but if you've been playing it for 20 years, it's much less demanding than taking on something new.

RATHER (VOICE OVER)

DR. KANDEL HOPES HIS OWN RESEARCH LEADS TO TREATMENT NOT JUST FOR AGING BRAINS... BUT FOR ALZHEIMERS... DEPRESSION... EVEN SCHIZOPHRENIA... ALL DISEASES WITH A LINK TO MEMORY. AND HE IS QUICK TO POINT TO ANOTHER BREAKTHROUGH IN BRAIN SCIENCE THAT IS ALREADY CHANGING LIVES. USING A THERAPY THAT RE-TRAINS THEIR BRAINS BY EXERCISING THEIR BODIES.... STROKE PATIENTS ARE GETTING THEIR DISABLED LIMBS TO WORK AGAIN.

KANDEL

It's a terrific rehabilitation therapy. It's now being generally used. And it speaks again to the fact that the plastic capability of the brain even in rehabilitation is much greater than we thought.

RATHER (VOICE OVER)

GORDON AND LORRAINE BANKS WERE ENJOYING AN ACTIVE RETIREMENT WHEN GORDON WENT OUT FOR HIS REGULAR RUN ONE MORNING FIVE YEARS AGO.

LORRAINE BANKS

He came home and had a little nap, as he often did. And when he woke up he wasn't, he sort of tried to get up and fell down.

RATHER (VOICE OVER)

IT WAS THE FIRST OF A SERIES OF STROKES...

GORDON BANKS, STROKE PATIENT

A day later, I had a second stroke. And two days later roughly, I had a third stroke. All light strokes but when they examined me, I had three hits to my brain.

RATHER (VOICE OVER)

THE DAMAGED AREAS IN HIS BRAIN LEFT HIM PARTIALLY PARALYZED ON HIS RIGHT SIDE AND AFFECTED HIS SPEECH.

LORRAINE BANKS

Well they told us originally that-- that if—

GORDON BANKS

If you were to walk again, it would probably be-- be with a cane.

LORRAINE BANKS

And whatever we got at six months would be what we had.

RATHER (VOICE OVER)

WHAT THEY HEARD WAS THE CONVENTIONAL MEDICAL THINKING THAT THE BRAIN CAN'T MAKE MUCH OF A COME BACK FROM STROKE DAMAGE.

GORDON BANKS

When I was in the hospital, there were people who had strokes who had just quit and given up. I've refused to. That's all I can say.

RATHER (VOICE OVER)

BUT AT SEVENTY YEARS OLD BANKS WASN'T READY TO GIVE UP HIS ACTIVE LIFE.

GORDON BANKS

I'm a pushy kind of guy personally and I pushed as hard as I could at everything I did. And that's one reason why I think I, I walked again.

RATHER (VOICE OVER)

HE WALKED BUT BANKS MORE OR LESS GAVE UP TRYING TO USE HIS RIGHT HAND UNTIL HE FOUND PROFESSOR EDWARD TAUB AT THE UNIVERSITY OF ALABAMA, BIRMINGHAM.

EDWARD TAUB, UNIVERSITY OF ALABAMA, BIRMINGHAM

We have found that a patient who has sustained a brain injury is not without hope.

RATHER (VOICE OVER)

FOR TWENTY YEARS TAUB HAS FOCUSED ON WHAT THE BRAIN'S PLASTICITY CAN DO FOR STROKE PATIENTS. AND IT'S LED HIM TO CREATE WHAT HE CALLS CONSTRAINT INDUCED MOVEMENT THERAPY OR C-I. THE CONSTRAINT IS THE MITT ON THE PATIENT'S GOOD HAND WHICH FORCES THE MOVEMENT TO HAPPEN ON THE DAMAGED SIDE.

GORDON BANKS

Now even though it's easier to do with my left-hand, I've got to say, "No, this one's gotta do the work."

RATHER (VOICE OVER)

PHYSICAL THERAPIST JEAN CRAGO KEEPS BANKS FROM TAKING THE EASIER ROUTE.

JEAN CRAGO, PHYSICAL THERAPIST

So the next time out there in the world when you find 15 dominoes in front of you, you'll be ready to flip them!

RATHER (VOICE OVER)

THE EXERCISES ARE FOR HIS HAND BUT THE REAL CHANGE IS HAPPENING DEEP INSIDE THE BRAIN.

TAUB

We found that after stroke the area of the brain involved in producing movement of the affected hand had shrunk by a half. This is the brain region that produces movement of the affected hand after just two weeks of CI therapy. And I think you can see that it has doubled in size.

RATHER (VOICE OVER)

THE RESULT OF THAT BRAIN RE-WIRING IS EVIDENT WATCHING GORDON BANKS. AT THE BEGINNING OF HIS THERAPY AT TAUB'S CLINIC...BANKS COULD BARELY GRASP A LARGE OBJECT.

CRAGO

World record speed here., 48:02. The first time you ever did this it took you close to 2 minutes.

RATHER (VOICE OVER)

AFTER TWO WEEKS HE WAS PICKING PENNIES FROM A JAR OF SLIPPERY BEANS AND USING TOOLS FROM EVERY DAY LIFE.

CRAGO

Did you try punching a few buttons on the remote?

BANKS

I did, yes...

RATHER (VOICE OVER)

THE BRAIN NOT ONLY LIKES TO LEARN...IT APPARENTLY LIKES TO EXERCISE, TOO.

RATHER

It seems to me certainly in my youth, which has been a long time ago but, it hasn't been that long ago, that if you had a stroke on the left side of your brain, and your right arm became useless, that that was considered permanent.

KANDEL

Yes.

RATHER

You better start learning how to use your other arm.

KANDEL

Right. It's the opposite. We want to tie up your good arm. So force you to use the other. It takes enormous effort in the part of the patient. We now realize that there is significant recuperative capability that is present in the brain if one puts sufficient challenge on the damaged area.

CRAGO

So when the door needs to be opened or the cup needs to be picked up? That right hand.

BANKS

Right hand, yup.

RATHER (VOICE OVER)

IT'S ANOTHER EXAMPLE THAT WHILE THE BRAIN IS AT ITS MOST PLASTIC IN EARLY CHILDHOOD ADULT BRAINS STILL HAVE THEIR OWN POWERS OF PLASTICITY.

GORDON BANKS

I just have an idea that the brain is not as stiff as you think it is and that there is room for pushing it around a bit so things will improve.

RATHER (VOICE OVER)

THE BANKS HEADED HOME TO CANADA WITH A LONG LIST OF EXERCISES TO CHALLENGE GORDON'S STILL RECOVERING BRAIN. IN CALIFORNIA...MARLENE AND BOB ALLEN ARE PLANNING TO MAKE BRAIN FITNESS PART OF THEIR ROUTINE, MAINTENANCE WORK THEY HOPE WILL MAKE AGING A MUCH SMOOTHER SAIL.

ALLEN

People spend more time-- at the gym or exercising. They're forgetting that one of the most important parts is your brain that you need to exercise!

RATHER (VOICE OVER)

FOR NOBEL PRIZE WINNER DR. ERIC KANDEL SEEING SCIENTIFIC DISCOVERIES BECOME REAL LIFE-IMPROVING PRACTICES IS PART OF WHAT CHALLENGES HIM TO KEEP EXPLORING.

RATHER

Do you or do you not consider the brain the last frontier of medicine?

KANDEL

It without doubt the last frontier of science. To understand how you work. To understand how the inner parts of your psyche operate. It's fantastic. This makes us who we are. You want to know what it's like in Mars? Who do you think the curiosity comes from? It comes from your squash. It comes from your brain. All the questions we ask of the world come from it.

RATHER

You call it the squash sometime? Is that what doctors call it?

KANDEL

The brain is a better term.

RATHER (VOICE OVER)

COMING UP NEXT: HOW BRAND NEW BRAIN CELLS ARE BORN THROUGHOUT LIFE... AND HOW WE MIGHT MAKE BETTER BRAINS IF WE PUT OUR MINDS TO IT.

BEGLEY

The old idea that once you have 40 candles on your birthday cake, it's never gonna get any better. In fact, it's gonna get worse. Really, that's just thrown out the window.

RATHER (VOICE OVER)

ONE OF THE GREAT LEAPS FORWARD IN NEUROPLASTICITY IS THE FINDING THAT IN ADDITION TO BEING ABLE TO REWIRE ITSELF THE BRAIN ALSO FORMS NEW CELLS THROUGHOUT LIFE.

BEGLEY

It had been thought that after the age of probably around six months to a year, the brain does not generate any new cells, any new neurons. Talk about dogma. I mean, that one, you know, you could take that to the bank.

RATHER (VOICE OVER)

JOURNALIST SHARON BEGLEY TRACKS NEUROSCIENTIFIC DISCOVERIES FOR NEWSWEEK MAGAZINE...

BEGLEY

In the early 90's, researchers in Sweden discovered that even the old brain, and here we're talking about, you know, brains all the way into their 50's, 60's, 70's, can generate new neurons. It's the process called neurogenesis. And this had been just undreamed of.

RATHER (VOICE OVER)

IT'S THE EXACT OPPOSITE OF THE LONG-HELD THEORY THAT NEURONS STOP FORMING AND THEN DIE OFF AS WE AGE.

BEGLEY

The old idea that again, once you have 40 candles on your birthday cake, it's never gonna get any better, in fact, it's gonna get worse. Really, that's just thrown out the window.

RATHER (VOICE OVER)

LIKE THE RESEARCH IN MEDITATION SCIENTISTS SUSPECTED THAT WHAT WAS GOOD FOR THE BODY MIGHT BE GOOD FOR THE BRAIN...SO THEY LOOKED FOR SIGNS OF NEUROGENESIS WHEN ELDERLY VOLUNTEERS STARTED EXERCISING.

BEGLEY

It turns out that just one hour a day of aerobic exercise, and by that the researcher meant doing mall walking, just walking around a mall. You don't have to press weights, you don't have to run on a treadmill. Simple, aerobic exercise increases neurogenesis. And this was in people who are well into adulthood.

RATHER

And this is considered scientific fact now?

BEGLEY

Absolutely.

KANDEL

Exercise is the best preventer of age-related memory loss.

RATHER (VOICE OVER)

AT COLUMBIA UNIVERSITY, COLLEAGUES OF NOBEL PRIZE WINNER DR. ERIC KANDEL FOUND IN 2007 A DIRECT LINK BETWEEN EXERCISE AND NEUROGENESIS.

KANDEL

Good physical fitness is very good not only for age-related memory loss but perhaps even for Alzheimer's Disease. So keeping physically fit is extremely important.

RATHER (VOICE OVER)

F-M-R-I EXAMS SHOWED EVIDENCE OF NEW BRAIN CELLS FORMING WHEN MIDDLE-AGED PEOPLE EXERCISED AN HOUR A DAY, FOUR TIMES A WEEK. AND KNOWING THAT THE BRAIN CAN GROW THOSE NEW CELLS AND MAKE NEW CONNECTIONS THROUGHOUT LIFE, DR. KANDEL IS NOW



SEARCHING FOR A WAY TO PREVENT --OR AT LEAST SLOW DOWN-- THE PUZZLING PHENOMENON OF AGE RELATED MEMORY LOSS.

KANDEL

I began to study mice that developed age-related memory loss. I saw it involved the hippocampus. I saw that it was a weakening of communications between cells. So I did these maneuvers and I found I could reverse the memory deficit in the mouse very well.

RATHER (VOICE OVER)

DR. KANDEL AND OTHERS ARE RACING TO FIND A DRUG THAT WILL TRIGGER THAT SAME KIND OF GENE-LEVEL RE-WIRING IN THE HUMAN BRAIN.

KANDEL

There are now a number of animal models that have given one clues to drugs that might help for age-related memory loss, or for Alzheimer's Disease and a number of companies are now trying to develop drugs that will be useful for both of these. Nothing is on the market that really is effective at the moment. But I feel very confident with the next, you know, five years we'll have significant advances in both of these areas.

RATHER (VOICE OVER)

IT'S ALL TOO NEW TO KNOW EXACTLY WHAT WILL WORK BUT THE ADVANCES IN NEUROPLASTICITY RESEARCH HOLD OUT BOTH PROMISE AND GREAT CHALLENGES FOR EVERYONE INVOLVED.

KANDEL

This is the most complicated problem we've ever confronted in science. This is more difficult than getting a man on the moon. This is more difficult than the genetic code. This is something that's gonna occupy us for the next 100 years.

BEGLEY

We really don't know what the limits of neuroplasticity are. But so far, everything that has been discovered suggests that we had sold the brain short. And in fact, we have much greater capacity for self-renewal, for growth, for improving ourselves than neuroscientists had ever dreamed.

RATHER

What do you expect to see coming next in this world of neuroscience?

BEGLEY

I would not be surprised to see it applied to muscular dystrophy, even to multiple sclerosis. These are all things that are under active investigation in some of the country's leading neuroscience labs. So, it's not just pie in the sky. It's not just dreaming.

DALAI LAMA

The discussion with modern science initially by my own curiosity ...

RATHER (VOICE OVER)

THE DALAI LAMA LIKES TO TELL SCIENTISTS THAT HIS OWN DREAM OF A DIALOGUE BETWEEN BUDDHISM AND SCIENCE BEGAN DURING HIS CHILDHOOD IN TIBET.

RATHER

When you first heard that scientists were beginning to explore the possibility that the brain could change, even rewire itself, what interested you the most?

DALAI LAMA

I think I can say since my childhood. I think out of my curiosity I always wondering what was that, what is that, what is that. Sometimes I describe myself as a scientist rather than religious person.

RATHER (VOICE OVER)

AS AN ADULT ... HE POINTS TO SCIENCE... NOT RELIGION ... AS THE BEST TOOL FOR TEACHING IN THE WORLD BEYOND THE BUDDHIST MONASTERIES.

RATHER

Most of the research has been done with people who know about meditation. For those people who don't meditate is there anything in this new science that would apply to them?

DALAI LAMA

Now there could be two categories. One, believer or religious minded, so part of their religious practice some meditation. My main concern is not that category. My main interest is usually I call secular ethics. So the people who have no interest about religion or about belief but they also you see, want a happy life. So now we need without touching any religious belief, simply on the basis of our common experience and

common sense based on scientific finding. That's the way to educate people, particularly younger generation.

RATHER (VOICE OVER)

THE DALAI LAMA HOPES WESTERN SCIENTIFIC STUDIES WILL CONTINUE TO CONNECT EMOTIONAL WELL-BEING TO PHYSICAL HEALTH AND ENCOURAGE MORE RESEARCH IN NEUROPLASTICITY.

DALAI LAMA

Some emotions are very good for not only peace of mind but also for health. Some emotions are very, very bad for our health. So therefore with these sort of fact we can educate more people.

RATHER (VOICE OVER)

FOR THE DALAI LAMA THE VALUE OF STUDYING THE MIND CARRIES OVER FROM HIS RELIGIOUS LIFE TO HIS ROLE AS TIBET-IN-EXILE'S POLITICAL LEADER.

DAN RATHER

Most of the world knows that you have great difficulty with China. You have said if you, if you meditate, if you bring a warm-heartedness, a desire for peace, non-violence, those things, that you will be happier. But my question is, does it work when you're facing an overwhelming power such as China?

DALAI LAMA

Now here I think meditation on compassion, not necessarily direct effect. Action is more important than meditation. However, on individual level the meditation on compassion is very, very helpful to keep one's own peace of mind.

RATHER (VOICE OVER)

THE DALAI LAMA SAYS HE WANTS SCIENTISTS TO EXPLAIN HOW MEDITATION WORKS AS A WAY TO FIND OUT IF THE REAL-LIFE EXPERIENCES OF TIBETAN BUDDHISTS COULD BENEFIT THE REST OF THE WORLD.

DALAI LAMA

Now here is one example. One Tibetan monk who since '59 until late seventies he remained in Chinese gulag. About 18 years he in Chinese prison. Early '80 now he come to India, and he told me few occasion he feel some danger. Then I asked, what kind of

danger? And he told me, danger of losing compassion towards Chinese. So see, he consider it is very, very important to keep compassion towards even your enemy. So that helps immensely about his peace of mind. So one occasion on meeting with scientists this subject or this story come in our conversation. So they want to interview some of those ex-prisoners. They found these Tibetans who spent many years in Chinese gulag always with the fear of death, in spite that their mental state is extraordinarily calm, healthy, they say. So, so the practice of compassion is very, very helpful to keep one's own mental function more normal.

RATHER

Your Holiness, you've been very patient with me and I appreciate it. What's next for you? Are you going to take a Professorship in science? They tell me you're studying for a doctorate in Quantum Physics now. True?

DALAI LAMA

I got some lessons. When I listen very carefully when they explain about quantum physics. When I listen seems I got something but as soon as that lesson finish, nothing left in my mind. So therefore I have keen interest about that but seems hopeless student.

DAN RATHER

Thank you so much, your Holiness. Thank you.

DALAI LAMA

Thank you.

RATHER (ON CAMERA)

FOR WESTERN SCIENCE, THE BREAKTHROUGH TECHNOLOGIES THAT NOW ALLOW US TO LOOK INSIDE THE BRAIN ARE BRINGING US EXTRAORDINARY DISCOVERIES. BUT STILL NO ONE CAN ANSWER THE QUESTION THE DALAI LAMA POSED: CAN TRAINING OUR MINDS – OUR THOUGHTS, OUR EMOTIONS, OUR MEMORIES—ACTUALLY CHANGE OUR BRAIN? NOW IN BUDDHIST MONKS WITH YEARS OF PRACTICE, MEDITATION CAN PRODUCE PHYSICAL CHANGES BUT WHAT ARE THOSE PHENOMENON? AND CAN THE SAME TECHNIQUES REALLY HELP US TO CHANGE OURSELVES, TO MAKE US TRULY BETTER PEOPLE? TO MAKE US HAPPIER? IT'S A TANTALIZING THOUGHT--- ONE SCIENTISTS AND THE DALAI LAMA WILL BE EXAMINING FOR YEARS TO COME. THIS MUCH WE ALREADY KNOW, IT'S A POTENTIAL FILLED WITH OPTIMISM AND HOPE. FOR HD NET, FROM DHARAMSALA INDIA, DAN RATHER REPORTING. GOOD NIGHT.