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SUPERIOR COURT OF THE STATE OF CALIFORNIA
FOR THE COUNTY OF LOS ANGELES
DEPARTMENT NO. 31 HON. G. KEITH WISOT, JUDGE

TRANSWESTERN PIPELINE COMPANY,	)	
A DELAWARE CORPORATION,	)	
	)	
PLAINTIFF,	)	
	)	
VS.	)	NO. BC 026959
	)	
MONSANTO COMPANY AND DOES 1	)	
THROUGH 200, INCLUSIVE,	)	
	)	
DEFENDANTS.	)	

REPORTER'S DAILY TRANSCRIPT OF PROCEEDINGS

DECEMBER 20, 1993
VOLUME 23
PAGES 3476- 3682

APPEARANCES:

FOR PLAINTIFF:	SHEARMAN & STERLING BY: JAMES P. TALLON, ESQ. & JANET M. GRADY, ESQ. & JERRY MARKS, ESQ. 725 SOUTH FIGUEROA STREET 21ST FLOOR LOS ANGELES, CA 90017
FOR DEFENDANT:	PREUSS, WALKER & SHANAGHER BY: CHARLES F. PREUSS, ESQ. & DONALD F. ZIMMER, ESQ. & ALAN LAZARUS, ESQ. 595 MARKET STREET 16TH FLOOR SAN FRANCISCO, CA 94105 DAVID A. SALYER, CSR #4410 OFFICIAL COURT REPORTER 111 NORTH HILL STREET LOS ANGELES, CA 90012

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1 LOS ANGELES, CALIFORNIA; MONDAY, DECEMBER 20, 1993

2 9:50 A.M.

3 DEPARTMENT NO. 31

G. KEITH WISOT, JUDGE

4 ---0---

5 (APPEARANCES AS HERETOFORE NOTED.)

6 (DAVID A. SALYER, OFFICIAL REPORTER.)

7
8 THE COURT: AND GOOD MORNING, LADIES AND
9 GENTLEMEN.

10 RESUMING TRIAL PROCEEDINGS IN
11 TRANSWESTERN VERSUS MONSANTO WITH ALL OF THE
12 APPROPRIATE PARTICIPANTS IN THEIR RESPECTIVE PLACES.

13 MR. TALLON, A FURTHER WITNESS --
14 MR. PREUSS, A FURTHER WITNESS?

15 MR. PREUSS: YES, YOUR HONOR, MONSANTO WOULD
16 LIKE TO CALL AT THIS TIME SCOTT TUCKER.

17 THE CLERK: RAISE YOUR RIGHT HAND, SIR, TO BE
18 SWORN.

19
20 EARL SCOTT TUCKER,
21 CALLED AS A WITNESS BY THE DEFENDANT, MONSANTO, WAS
22 SWORN AND TESTIFIED AS FOLLOWS:

23
24 THE WITNESS: YES, SIR.

25 THE CLERK: PLEASE, BE SEATED.

26 PLEASE STATE AND SPELL YOUR NAME FOR THE
27 RECORD.

28 THE WITNESS: MY NAME IS EARL SCOTT TUCKER THE

1 THIRD AND IT'S E-A-R-L, S. T-U-C-K-E-R, AND THE ROMAN
2 NUMERAL THREE.

3 THE COURT: MR. PREUSS.

4
5 DIRECT EXAMINATION

6 BY MR. PREUSS:

7 Q GOOD MORNING, DR. TUCKER.

8 A GOOD MORNING.

9 Q WHERE DO YOU RESIDE, SIR?

10 A I CURRENTLY RESIDE IN SOUTH CAROLINA AT
11 261 NORTH MC ALLISTER IN LIBERTY, SOUTH CAROLINA.

12 Q AND WHAT IS YOUR DATE OF BIRTH, SIR?

13 A 12-14-39.

14 Q ARE YOU MARRIED?

15 A YES, SIR.

16 Q AND DO YOU HAVE CHILDREN?

17 A YES, SIR, I HAVE TWO CHILDREN.

18 Q AND WHAT IS YOUR OCCUPATION, SIR?

19 A MY OCCUPATION IS A CHEMIST, MORE
20 SPECIFICALLY AN ANALYTICAL CHEMIST.

21 Q AND WHAT IS THAT, AN ANALYTIC CHEMIST?

22 A AN ANALYTICAL CHEMIST A BASICALLY A
23 CHEMIST WHO MEASURES THINGS IN THE AREA OF CHEMISTRY,
24 ENVIRONMENTAL CHEMISTRY, PROCESS CHEMISTRY, THINGS OF
25 THAT SORT.

26 Q WHAT IS YOUR EDUCATIONAL BACKGROUND
27 BEGINNING WITH COLLEGE, SIR?

28 A I HAVE AN ASSOCIATES DEGREE FROM THE

1 UNIVERSITY OF MICHIGAN.

2 I HAVE A BACHELOR'S DEGREE FROM MICHIGAN
3 STATE UNIVERSITY.

4 AND I HAVE A PH.D FROM THE UNIVERSITY OF
5 IOWA.

6 Q AND WHAT IS THE AREA IN WHICH YOU
7 ACHIEVED YOUR PH.D, SIR?

8 A MY PH.D WAS IN ANALYTICAL ORGANIC
9 CHEMISTRY.

10 Q WHAT IS ORGANIC CHEMISTRY?

11 A "ORGANIC" HAS TO DO WITH CHEMICAL
12 COMPOUNDS THAT ARE ORGANIC IN NATURE.

13 IN OTHER WORDS, WHAT THAT BASICALLY MEANS
14 IS THEY ARE MADE UP OF CARBON, HYDROGEN AND THAT KIND
15 OF THING, HYDROCARBONS, GASOLINE, FOR EXAMPLE, IS AN
16 ORGANIC CHEMICAL, EXCUSE ME.

17 Q WHAT IS THE SUBJECT MATTER OF YOUR
18 THESIS, SIR?

19 A "THE ANALYTICAL INVESTIGATION OF MONO-2
20 AZARAL HYDRAZONES" WAS THE TECHNICAL TITLE OF MY
21 THESIS.

22 Q IS THERE A LAY TRANSLATION OF THAT?

23 A WHAT IT DEALT WITH IS DESIGNING MOLECULAR
24 STRUCTURES THAT COULD BE USED TO DETERMINE SPECIFIC
25 METTALINES IN DIFFERENT KINDS OF SAMPLES,
26 ENVIRONMENT, THINGS OF THAT SORT.

27 Q AND DID YOU RECEIVE A SCHOLARSHIP TO
28 SUPPORT YOUR PH.D ACTIVITIES, SIR?

1 A YES.

2 I WAS AWARDED A NASSAU TRAINEESHIP WHICH
3 WAS A FULL SCHOLARSHIP FOR GETTING MY PH.D.

4 I THINK THAT IS THE NATIONAL AERONAUTICAL
5 AND SPACE SCHOLARSHIP.

6 Q WHAT WAS YOUR FIRST JOB AFTER COMPLETING
7 YOUR FORMAL EDUCATION, SIR?

8 A MY FIRST JOB WAS WITH MONSANTO COMPANY IN
9 ST. LOUIS, MISSOURI.

10 Q WHAT YEAR WAS THAT?

11 A THAT WAS IN 1967.

12 Q AT THAT TIME HAD YOU ACTUALLY HAD YOUR
13 PH.D DEGREE AWARD?

14 A NO.

15 AT THAT TIME I HAD THE TYPIST -- DIDN'T
16 GET MY THINGS TO THE TYPIST SOON ENOUGH.

17 WE DIDN'T MEET THE DEADLINE FOR
18 SUBMITTING IT.

19 I HAD COMPLETED EVERYTHING SO I HAD TO
20 WAIT UNTIL THE NEXT CYCLE.

21 I CHOSE TO GO TO WORK FOR MONSANTO IN THE
22 SEPTEMBER OF 1967 AND THEN COME BACK AND DEFEND MY
23 THESIS IN FRONT OF THE COMMITTEE.

24 Q WHAT DO YOU MEAN "DEFEND" YOUR THESIS?

25 A WHAT BASICALLY HAPPENS IS THAT THE TYPED
26 COPY OF THE THESIS IS SUBMITTED TO A COMMITTEE OF
27 PH.D'S AT THE UNIVERSITY THAT ARE ADVISERS.

28 THEY REVIEW THE THESIS AND MAKE SURE

1 EVERYTHING IS CORRECT AND THAT THEY AGREE WITH THIS
2 AND THAT, THAT KIND OF THING, AND THAT IT'S COMPLETE
3 AND THAT IT'S WORTHY OF A DEGREE.

4 Q NOW, HOW DID YOU GO ABOUT GETTING YOUR
5 JOB WITH MONSANTO, SIR?

6 A AT THAT PARTICULAR TIME A LOT OF THE
7 LARGE CHEMICAL COMPANIES AND PEOPLE INTERESTED IN
8 HIRING CHEMISTS SENT RECRUITERS TO THE CAMPUS.

9 AND THE RECRUITERS WOULD SPEND A DAY AT
10 THE CAMPUS AND SCHEDULE INTERVIEWS WITH VARIOUS
11 CANDIDATES THAT WERE GOING TO GRADUATE.

12 AT THAT POINT IN TIME THERE WAS A REAL
13 SHORTAGE OF CHEMISTS AND ESPECIALLY WITH ADVANCED
14 DEGREES.

15 SO THERE WAS A GOOD MARKET.

16 SO THERE WERE A LOT OF JOB INTERVIEWS
17 AVAILABLE.

18 Q WE WILL GET INTO THE DETAILS OF YOUR JOB
19 RESPONSIBILITIES AT MONSANTO, SIR.

20 FIRST, TELL US HOW LONG DID YOU REMAIN
21 WITH MONSANTO AFTER BEGINNING THERE IN 1967?

22 A I BELIEVE I REMAINED WITH MONSANTO UNTIL
23 1978 WHICH IS ROUGHLY 11 YEARS.

24 Q AND AFTER LEAVING MONSANTO WHAT WAS YOUR
25 NEXT EMPLOYMENT?

26 A I WENT TO WORK FOR A COMPANY CALLED AMF
27 INCORPORATED.

28 AMF STANDS FOR AMERICAN MACHINE AND

1 FOUNDRY.

2 THEY WERE LOCATED IN STANFORD,
3 CONNECTICUT.

4 I WORKED AT THE CORPORATE ENGINEERING.
5 YOU WOULD KNOW THE COMPANY THROUGH THE AMF BOWLING
6 CENTERS, THINGS OF THAT SORT.

7 Q WHAT WAS YOUR JOB RESPONSIBILITY?

8 A MY JOB RESPONSIBILITY THERE WAS TO RUN
9 ENGINEERING AND ANALYTICAL LABORATORIES IN SUPPORT OF
10 THE PROJECTS OF THE COMPANY.

11 Q AND HOW LONG DID YOU STAY WITH AMF?

12 A I WAS WITH AMF UNTIL 1985.

13 IN 1985 AMF WAS INVOLVED IN A HOSTILE
14 TAKEOVER AND THEN THEY WERE THE -- THE COMPANY WAS
15 DISBANDED.

16 THE PEOPLE WERE SUCCESSFUL IN TAKING OVER
17 THAT COMPANY AND, OF COURSE, SHUT DOWN CORPORATE
18 RESEARCH AND THINGS OF THAT SORT.

19 AT THAT POINT IN TIME I LOOKED FOR
20 ANOTHER JOB.

21 Q DID YOU FIND ONE?

22 A YES, SIR.

23 Q WITH WHAT ORGANIZATION?

24 A I FOUND A JOB WITH A COMPANY CALLED WASTE
25 MANAGEMENT INCORPORATED LOCATED IN CHICAGO, ILLINOIS.

26 Q AND WHAT IS THE BUSINESS OF WASTE
27 MANAGEMENT, SIR?

28 A WASTE MANAGEMENT IS THE WORLD'S LARGEST

1 INTEGRATED WASTE MANAGEMENT COMPANY.

2 THEY MANAGE REGULAR MUNICIPAL WASTES, YOU
3 HAVE SEEN THE PURPLE TRUCKS I'M SURE, AND ALSO
4 CHEMICAL AND RADIOACTIVE WASTES, THINGS OF THAT SORT.

5 Q WHAT HAS BEEN YOUR JOB WITH WASTE
6 MANAGEMENT SINCE JOINING IN 1981?

7 A I WAS HIRED TO BRING UP THEIR CORPORATE
8 HAZARDOUS WASTE ANALYTICAL LABORATORY IN CHICAGO, A
9 LABORATORY THAT TAKES HAZARDOUS WASTES SAMPLES AND
10 DETERMINES THE LEVEL OF HAZARD CONSTITUENTS IN THE
11 SAMPLES AND REPORTS IT BACK TO PEOPLE WHO NEED TO
12 KNOW THE LEVELS IN TERMS OF CLEANING UP AREAS AND IN
13 TERMS OF THE COMPLIANCE ASSOCIATED WITH THE
14 REGULATIONS AND ALSO SAFETY.

15 Q AND DOES WASTE MANAGEMENT HAVE
16 LABORATORIES LOCATED IN VARIOUS LOCATIONS AROUND THE
17 COUNTRY?

18 A YES, SIR.

19 WASTE MANAGEMENT HAS ON THE ORDER OF 35
20 LABORATORIES IN THE UNITED STATES AND IN FACT
21 INTERNATIONALLY TOO.

22 THEY RANGE FROM VERY SMALL LABORATORIES
23 WITH ONE OR TWO PEOPLE TO 30 MILLION LABORATORIES
24 DEDICATED TO NOTHING BUT GROUNDWATER MONITORING, FOR
25 EXAMPLE.

26 Q AND HAVE YOU HAD A ROLE IN SETTING UP
27 THOSE LABORATORIES?

28 A YES.

1 AS I MENTIONED EARLIER I WAS BROUGHT ON
2 BOARD TO SETUP AND GET STARTED THE FIRST CORPORATE
3 HAZARDOUS WASTE LABORATORY IN CHICAGO AND THEN
4 SUBSEQUENT TO THAT I STARTED UP LABORATORIES IN
5 EUROPE AND HOLLAND AND ALSO IN A TECHNICAL CENTER
6 WHERE I'M LOCATED RIGHT NOW AND THEN HONG KONG ALSO.

7 Q AS PART OF YOUR WORK WITH WASTE
8 MANAGEMENT HAVE YOU DEALT WITH TESTING AND ANALYZING
9 OF PCB SAMPLES, SIR?

10 A YES, SIR.

11 Q COULD YOU TELL US WHAT YOUR LEVEL OF
12 EXPERIENCE HAS BEEN WITH WASTE MANAGEMENT WITH
13 RESPECT TO ANALYZING PCB SAMPLES?

14 A WELL, ONE OF THE REGULATED HAZARDOUS
15 CONSTITUENTS, OF COURSE, ARE POLYCHLORINATED
16 BIPHENYLS.

17 IN FACT THOSE WERE IN THE EARLY TOXIC
18 SUBSTANCES ACT, WERE REALLY THE START OF ALL OF OUR
19 KNOWLEDGE IN THESE PARTICULAR AREAS AND OUR CONCERN
20 FOR DOING THINGS.

21 SO THE COMPANY ANALYZES, LITERALLY,
22 THOUSANDS OF PCB SAMPLES ON A MONTHLY BASIS AND THE
23 LABORATORIES I'M ASSOCIATED WITH DO THAT IN
24 ACCORDANCE WITH THE REGULATORY REQUIREMENTS.

25 Q DO YOU HAVE ANY ROLE IN SUPERVISING THAT
26 ACTIVITY FOR THE COMPANY, SIR?

27 A YES.

28 I HAVE DIRECTED SEVERAL OF THEIR

1 CORPORATE LABORATORIES.

2 Q OKAY. ARE YOU A MEMBER OF ANY
3 PROFESSIONAL SOCIETIES, SIR?

4 A YES, SIR.

5 I BELONG TO THE AMERICAN CHEMICAL SOCIETY
6 AND HAVE SINCE, GOSH, 1963 OR '67.

7 I'M ALSO CURRENTLY ON THE BOARD OF
8 DIRECTORS OF AN ORGANIZATION THAT IS CALLED THE
9 INTERNATIONAL ASSOCIATION OF ENVIRONMENTAL TESTING
10 LABORATORIES.

11 BASICALLY WHAT THAT IS A TRADE
12 ORGANIZATION THAT REPRESENTS THE INTERESTS OF OVER 60
13 PERCENT OF THE COMMERCIAL ANALYTICAL LABORATORIES IN
14 THE UNITED STATES AND CANADA.

15 Q AND DOES THAT ORGANIZATION PARTICIPATE IN
16 COMMON PROBLEMS ASSOCIATED WITH ANALYZING VARIOUS
17 SAMPLES THAT MAY BE FOUND IN THE ENVIRONMENT?

18 A THAT'S CORRECT.

19 ITS MAJOR ACTIVITIES ARE ON BEHALF OF THE
20 ANALYTICAL ENVIRONMENTAL COMMUNITY AND IN TERMS OF
21 THE TYPES OF METHODS THAT ARE USED, THE
22 ACCREDITATIONS THAT ARE USED, THE QUALITY CONTROL
23 THAT IS USED, THINGS OF THAT SORT.

24 Q AND HAVE YOU HAD ANY WORK IN THE AREA OF
25 BIODEGRADATION IN CONNECTION WITH YOUR JOB WITH WASTE
26 MANAGEMENT, SIR?

27 A ABOUT THE JOB WITH WASTE MANAGEMENT I'M
28 NOT DIRECTLY RELATED WITH THOSE KINDS OF

1 TECHNOLOGIES, BUT THOSE ARE ENGINEERING TECHNOLOGIES
2 USED TO BIOREMEDIATE SITES THAT NEED TO BE
3 REMEDIATED.

4 Q NOW, HAVE YOU PUBLISHED AT ALL IN THE
5 AREAS OF PCB'S, SIR?

6 A YES, SIR.

7 Q AND HAVE YOU PUBLISHED IN THE AREA OF
8 BIODEGRADATION?

9 A YES, SIR.

10 Q AND WHAT HAS BEEN THE SUBJECT MATTER OF
11 YOUR PUBLICATIONS IN THOSE TWO AREAS, SIR?

12 A THE AREA OF THE POLYCHLORINATED BIPHENYLS
13 THE SUBJECT MATTER DEALT WITH THE BIODEGRADABILITY OF
14 THESE MATERIALS.

15 IN FACT, WE, MONSANTO, WE AUTHORED SOME
16 OF THE VERY EARLY PUBLICATIONS THAT DEALT WITH THAT
17 PARTICULAR ITEM AND, IN FACT, DISCOVERED THAT
18 BIODEGRADATION REALLY DID OCCUR.

19 ALSO WITH OTHER TYPES OF MONSANTO
20 PRODUCTS WE USED TO STUDY THE BIODEGRADABILITY OF
21 THOSE, PCB RESIDUES, DETERMINATION OF PCB'S IN ANIMAL
22 TISSUES AND THINGS OF THAT SORT, THE METHODOLOGIES
23 FOR THOSE KINDS OF THINGS AND THE RESULTS OF THOSE
24 FINDINGS, THAT IS, THE FLAVOR, PRIMARILY OF
25 ANALYTICAL CHEMISTRY.

26 Q THAT HAS BEEN THE AREA OF YOUR
27 PUBLICATIONS, HAS BEEN THE AREA OF ANALYTIC CHEMISTRY
28 WITH ARTICLES DEALING SPECIFICALLY WITH PCB ISSUES?

1 A YES.

2 Q OKAY. LET'S GO BACK TO 1967 WHEN YOU
3 JOINED MONSANTO AS AN ANALYTIC CHEMIST.

4 SHORTLY AFTER JOINING MONSANTO DID YOU
5 RECEIVE AN ASSIGNMENT RELATING TO THE ISSUE OF PCB'S,
6 SIR?

7 A YES, SIR.

8 Q AND WHAT WAS THE NATURE OF THE ASSIGNMENT
9 YOU RECEIVED?

10 A THE COMPANY HAD BEEN APPRAISED OF THE
11 FACT THROUGH ITS EUROPEAN CONNECTIONS THAT THERE WERE
12 SOME SCIENTISTS IN SWEDEN, JENSEN AND WIDMARK, WHO
13 WERE REPORTEDLY OBSERVING POLYCHLORINATED BIPHENYLS.

14 THEY TALKED ABOUT POLYCHLORINATED
15 BIPHENYLS AND/OR POLYCHLORINATED BIPHENOLS IN
16 ENVIRONMENTAL SAMPLES.

17 AND THAT HAD BEEN BROUGHT TO THE
18 COMPANY'S ATTENTION AND THESE FOLKS WERE ANALYTICAL
19 CHEMISTS PRIMARILY INTERESTED IN ANALYZING
20 ENVIRONMENTAL SAMPLES FOR PESTICIDES.

21 SO I WAS APPROACHED AS AN ANALYTICAL
22 CHEMIST TO LOOK AT THE METHODOLOGIES THEY WERE USING
23 AND TO BEGIN TO ESTABLISH WITHIN MONSANTO THE
24 CAPABILITY TO DO THOSE KINDS OF THINGS AND TO
25 VALIDATE THE INFORMATION THAT WE WERE RECEIVING FROM
26 THIS ONE SCIENCE INSTITUTE.

27 Q OKAY. A COUPLE OF WORDS YOU USED.
28 FIRST WAS "METHODOLOGIES."

1 WHAT DO YOU TALK ABOUT WHEN YOU USE THAT
2 TERM, SIR?

3 A IN THE CONTEXT OF ANALYTICAL CHEMISTRY,
4 WHEN I TALK ABOUT A METHOD, WHAT I'M TALKING ABOUT IS
5 A PROCEDURE THAT ALLOWS YOU TO TAKE A SAMPLE, FOR
6 EXAMPLE, AIR, WATER, SOIL, TISSUE RESIDUES, SLUDGES,
7 THINGS OF THAT SORT AND EXTRACT THE CONSTITUENTS YOU
8 ARE INTERESTED IN OUT OF THAT SAMPLE FROM THE BULK OF
9 THE MATRIX.

10 THE SAMPLE IS CALLED THE MATRIX. THEN
11 THEY TAKE THAT THROUGH VARIOUS STEPS THAT ISOLATE IT,
12 QUANTIFIEDLY, MEANING THAT YOU DON'T LOSE ANY OF IT,
13 AND THEN GET IT INTO A FORMAT WHERE YOU CAN GET IT TO
14 AN ANALYTICAL INSTRUMENT THAT IS CAPABLE OF DETECTING
15 THE MATERIAL, IN OTHER WORDS, TELLING IF IT'S THERE
16 IN THE EXTRACTS AND IF IT IS THERE, HOW MUCH.

17 THAT IS WHAT I MEAN BY AN ANALYTICAL
18 METHOD.

19 Q SORT OF THE ABC'S AS TO HOW TO GO ABOUT
20 THAT PROCESS?

21 A CORRECT.

22 Q YOU ALSO USED THE TERM "VALIDATION."
23 WHAT DID YOU MEAN BY THAT, SIR?

24 A CORRECT.

25 ONE OF THE KEY AREAS IN ANALYTICAL
26 CHEMISTRY IS WHEN YOU ANALYZE SOMETHING, YOU NEED TO
27 KNOW WITH AS HIGH A PROBABILITY AS POSSIBLE THAT WHAT
28 YOU ARE FINDING IS REAL AND THAT THE LEVEL THAT YOU

1 ARE FINDING IN SOMETHING IS THE ACTUAL LEVEL THAT IS
2 THERE.

3 AND THAT IS REALLY THE BASIS FOR THE
4 QUALITY ASSURANCE AND QUALITY CONTROL THAT IS
5 ABSOLUTELY NECESSARY FOR ANALYTICAL CHEMISTRY.

6 Q AGAIN, YOU ADDED A COUPLE TERMS, "QUALITY
7 ASSURANCE AND QUALITY CONTROL."

8 TELL US WHAT THOSE TWO TERMS MEAN.

9 A QUALITY ASSURANCE IS AN OVERALL PROGRAM
10 WHEREBY THE DATA GENERATED USING CERTAIN STANDARD
11 OPERATING PROCEDURES, IT'S LEVEL IS KNOWN.

12 THE PROBABILITY OF BEING TRUE IS KNOWN.

13 THE QUALITY ASSURANCES ARE THE KIND OF
14 THINGS YOU DO IN TERMS OF CALIBRATING INSTRUMENTS,
15 RUNNING STANDARDS, THINGS OF THAT SORT, THAT ASSURE
16 THAT WHAT YOU ARE DOING IS CORRECT AND THAT PROVIDE A
17 RECORD THAT CAN BE AUDITED AND SHOW THAT YOU ARE
18 CORRECT.

19 ALL OF THIS, WHAT IT AMOUNTS TO IS THAT
20 WHEN I DEVELOP A METHOD IN MY LABORATORY AND EVEN
21 THAT METHOD IS USED BY OTHER LABORATORIES WHO DON'T
22 WANT TO REINVENT THE WHEEL, THERE HAS TO BE ENOUGH
23 INFORMATION GENERATED TO SHOW THAT BOTH LABORATORIES
24 ARE APPLYING THE TECHNIQUE IN ABSOLUTELY THE SAME WAY
25 SO WE ARE BOTH PRODUCING AMOUNTS THAT ARE
26 COMPARABLE.

27 Q SO IF ONE LABORATORY GETS CERTAIN
28 RESULTS, THEN YOU CAN BE CONFIDENT THAT, IN FACT,

1 THOSE RESULTS ARE AS STATED?

2 A THAT IS CORRECT.

3 WE DO A LOT OF WORK WITH PERFORMANCE
4 EVALUATION SAMPLES, SHARING SAMPLES WITH EACH OTHER
5 TO MAKE SURE THE NUMBERS WE PRODUCE AT DIFFERENT
6 LABORATORIES ARE EQUIVALENT.

7 Q AND DID YOU HAVE AN UNDERSTANDING, WHEN
8 YOU RECEIVED THIS ASSIGNMENT, AS TO WHO AMONG
9 DR. JENSEN AND DR. WIDMARK HAD DONE THE ACTUAL
10 ANALYTIC WORK?

11 A YES.

12 IT WAS MY UNDERSTANDING THAT SOREN JENSEN
13 WAS THE BENCH CHEMIST, AS WE LIKED TO CALL THEM,
14 ASSOCIATED WITH DOING THE ACTUAL WORK AND DIRECTING
15 TECHNICIANS, I ASSUME, THAT WORK FOR HIM TOO AND THAT
16 GUNNAR WIDMARK WAS THE DIRECTOR OF THE INSTITUTION AT
17 WHICH SOREN JENSEN WORKED.

18 Q DID YOU HAVE AN UNDERSTANDING AS TO THE
19 LEVELS OF PCB'S BEING FOUND OR BEING REPORTED BY
20 DRS. JENSEN AND WIDMARK?

21 A THEY WERE REPORTING VERY LOW LEVELS OF
22 POLYCHLORINATED BIPHENYLS IN WHAT WE CALL "PART PER
23 MILLION, PART PER BILLION, PART PER TRILLION RANGE."

24 Q AND CAN YOU QUANTIFY FOR US IN SOME
25 REAL-LIFE EXPERIENCE AS TO WHAT, SAY, A PART PER
26 MILLION, PART PER BILLION OR PART PER TRILLION RANGE
27 IS?

28 A THAT IS ALWAYS A DIFFICULT CONCEPT FOR

1 SOMEONE WHO HAS BEEN IN THE BUSINESS, LIKE I HAVE FOR
2 26 YEARS, TO GET YOUR HANDS AROUND.

3 I GUESS ONE OF THE WAYS YOU MIGHT LOOK AT
4 IT, I GUESS THERE IS SOMETHING LIKE 13 MILLION PEOPLE
5 IN THE LOS ANGELES AREA.

6 A PART PER MILLION WOULD BE LIKE LOCATING
7 13 OF THOSE PEOPLE AMONGST THE 13 MILLION.

8 SO 13 OVER THE TOTAL POPULATION OF THE
9 LOS ANGELES AREA WOULD BE A PART PER MILLION.

10 FROM THERE THE SITUATION DOESN'T GET MUCH
11 BETTER.

12 A PART PER BILLION IS 11 THOUSANDTHS OF
13 THAT.

14 AND A PART PER TRILLION IS 11 THOUSANDTHS
15 OF A PART PER BILLION.

16 SO WE ARE, INDEED, DEALING WITH VERY LOW
17 LEVELS.

18 Q AND ARE THOSE SOMETIMES REFERRED TO AS
19 TRACE AMOUNTS?

20 A YES, SIR.

21 Q DID YOU HAVE AN UNDERSTANDING WITH
22 RESPECT TO THE FINDINGS OF DRS. JENSEN AND WIDMARK AS
23 TO WHAT TYPES OF CHLORINATED PCB'S THEY WERE
24 REPORTING HAVING FOUND?

25 A ULTIMATELY, SEVERAL MONTHS AFTER THE
26 ORIGINAL REPORT, IT WAS VERIFIED THAT WHAT THEY WERE
27 PURPORTEDLY SAYING THEY WERE FINDING WERE PCB'S,
28 POLYCHLORINATED BIPHENYLS VERSUS POLYCHLORINATED

1 BIPHENOLS.

2 Q PERHAPS YOU COULD USE THE EASEL THERE IN
3 FRONT OF YOU AND TELL US WHAT A PCB LOOKS LIKE.

4 A OKAY.

5 Q AND THEN TELL US THE TYPES OF PCB'S THAT
6 MAY BE FOUND AND WE WILL GO FROM THERE.

7 A OKAY. I WILL BE HAPPY TO ATTEMPT TO.

8 Q THANK YOU.

9 A WE HAVE A WAY OF SYMBOLIZING WHAT
10 CHEMICALS ARE.

11 I DON'T KNOW HOW FAMILIAR YOU ARE WITH
12 IT.

13 I WILL TRY TO EXPLAIN IT TO THE BEST OF
14 MY ABILITY SO WE CAN GET A GOOD FEELING FOR WHAT WE
15 ARE TALKING ABOUT.

16 I HAVE A TENDENCY TO TALK TOO FAST, SO I
17 WILL TRY TO MODERATE THAT.

18 Q WELL, I WILL TRY TO MONITOR THE
19 EXPRESSION ON THE COURT REPORTER'S FACE.

20 A OKAY.

21 I'M SORRY, YOUR HONOR, I DON'T.

22 THIS IS A BASIC SYMBOL WE WOULD USE TO
23 REPRESENT A MOLECULE CALLED BIPHENYL, OKAY?

24 THAT IS WHAT YOU HEAR SO MUCH ABOUT WHEN
25 PEOPLE TALK ABOUT POLYCHLORINATED BIPHENYLS.

26 "POLY" MEANS MANY AND "CHLORINATED"
27 MEANS THAT YOU PUT CHLORINE ON THIS PARTICULAR RING
28 ON THIS STRUCTURE.

1 AT THESE JUNCTURES WE HAVE WHAT ARE
2 CALLED CARBONS. ATTACHED TO THESE CARBONS ARE
3 HYDROGENS.

4 Q NOW YOU ARE DRAWING JUST THE BIPHENYL; IS
5 THAT RIGHT?

6 A THAT'S CORRECT.

7 Q NOW IS THE BIPHENYL BY ITSELF, WITHOUT
8 ANY CHLORINATION, COMMONLY FOUND IN OUR WORLD?

9 A BIPHENYL ITSELF, WITHOUT ANY CHLORINES
10 ADDED TO IT IS A NATURALLY OCCURRING CONSTITUENT IN
11 THE ENVIRONMENT, PRESENT IN ALMOST ANY KINDS OF
12 HYDROCARBONS AROUND AND IT'S JUST VERY COMMON IN
13 PLANTS AND COMMON IN OTHER KINDS OF HYDROCARBONS LIKE
14 PETROLEUM-BASED THINGS.

15 SO IT'S A NATURALLY OCCURRING
16 CONSTITUENT.

17 IN FACT, IF YOU PUT YOUR HAND HERE, COVER
18 THE OTHER HALF, THIS LOWER HALF IS LIKE BENZENE. I'M
19 SURE YOU HAVE HEARD ABOUT BENZENE. THEY ARE AROMATIC
20 HYDROCARBONS.

21 AT ANY RATE, WE WOULD SAY THAT THIS IS A
22 C-12, H-10, THAT THERE ARE 12 CARBONS AND 10
23 HYDROGENS ON THIS STRUCTURE.

24 Q OKAY. LET ME STOP YOU THERE.

25 WHAT YOU ARE SAYING IS THAT IF WE ADD UP
26 ALL THE CARBONS THAT YOU PUT THE C'S THERE, WE WOULD
27 COME UP WITH 12 AND THE SAME WITH RESPECT TO
28 HYDROGEN?

1 A THAT'S RIGHT, ONE, TWO, THREE, FOUR,
2 FIVE, SIX, AND YOU WOULD JUST DOUBLE IT.

3 SO THERE ARE 12 CHLORINES AND 10
4 HYDROGENS.

5 THAT IS THE BASIS FOR BIPHENYL AND THAT
6 IS THE BASIS FOR THE STARTING POINT, ONE OF THE RAW
7 MATERIALS, ACTUALLY, FOR MANUFACTURING
8 POLYCHLORINATED BIPHENYLS.

9 WHAT IS DONE NEXT IS YOU SIMPLY, THIS IS
10 A LITTLE BIT SIMPLIFIED, YOU TAKE CHLORINE AND CL IS
11 THE SYMBOL US CHEMISTS USE FOR CHLORINE.

12 YOU WOULD KNOW CHLORINE AS SOMETHING THAT
13 GOES INTO YOUR WATER TO KEEP DID BACTERIA FROM
14 GROWING, SOMETHING THAT YOU PUT IN YOUR POOL TO
15 SUPPRESS ALGAE AND TO KEEP IT CLEAN, THINGS OF THAT
16 SORT.

17 YOU TAKE CHLORINE AND YOU COMBINE IT WITH
18 THE BIPHENYL AND YOU REPLACE -- YOU INITIALLY START
19 BY REPLACING ONE OF THESE HYDROGENS WITH ONE OF THESE
20 CHLORINES.

21 SO YOU ADD A CHLORINE TO IT AND YOU LOSE
22 A HYDROGEN AND ANOTHER CHLORINE.

23 I INDICATED THERE WERE TWO CHLORINES HERE
24 BY THIS SUBSCRIPT.

25 ONCE YOU PUT A CHLORINE HERE, THEN YOU
26 HAVE WHAT IS CALLED MONOCHLORAL BIPHENYL.

27 "MONO" MEANS YOU HAVE SUBSTITUTED ONE OF
28 THE HYDROGENS WITH A CHLORINE.

1 THIS PROCESS GOES ON SUCH THAT WHEN YOU
2 PUT ANOTHER CHLORINE ON THERE AND SUBTRACT ANOTHER
3 HYDROGEN YOU HAVE WHAT IS CALLED A DICLORO BIPHENYL
4 AND SO ON.

5 YOU CAN ACTUAL HAVE A TRI, A TETRA, A
6 PENTA, "PENTA" BEING FIVE, HEXA, OCTA, NONA, DECA.

7 "DECA" MEANS 10 AND, OF COURSE, THAT
8 WOULD MEAN THAT EVERY HYDROGEN ON THIS HAS BEEN
9 REPLACED WITH A CHLORINE.

10 WHAT IT INDEED SAYS IS THAT YOU CAN HAVE
11 10 DIFFERENT HOMOLOGS.

12 YOU CAN HAVE BIPHENYLS, A MONOCHLORO
13 BIPHENYL, A DICLORO, ET CETERA, UP TO 10.

14 SO THERE ARE 10 DIFFERENT BASIC
15 CONSTITUENTS THAT CAN BE IN A MATERIAL CALLED A
16 POLYCHLORINATED BIPHENYL.

17 THE SITUATION, UNFORTUNATELY, IS NOT
18 REALLY EVEN THAT SIMPLE.

19 AND LET ME DEMONSTRATE WHY I SAY THAT.

20 LET'S TAKE THE SIMPLEST CASE WHERE WE
21 HAVE A STRUCTURE THAT IS C-12, H-9, AND ONE CHLORINE.

22 IN OTHER WORDS, AS YOU REMEMBER BEFORE,
23 IT WAS C-12, H-10 AND NOW I HAVE TAKEN AWAY ONE OF
24 THE HYDROGENS AND PUT A CHLORINE IN SO I HAVE WHAT IS
25 CALLED A MONOCHLORO BIPHENYL WHICH IS ONE OF THE
26 HOMOLOGS.

27 Q YOU MENTIONED THE TERM "HOMOLOG."

28 A RIGHT.

1 Q TELL US WHAT THAT IS.

2 A HOMOLOG IS JUST ANY OF THE SERIES THAT
3 HAVE THE BASIC BIPHENYL STRUCTURE WITH ONE OR MORE
4 CHLORINES ON IT.

5 THEY ARE ALL RELATED TO EACH OTHER
6 BECAUSE THEY HAVE THE SAME BASIC STRUCTURE.

7 WITHIN THE MONOCHLORO BIPHENYL, BECAUSE
8 YOU HAVE 12 DIFFERENT POSITIONS, SIX DIFFERENT
9 POSITIONS HERE AND SIX DIFFERENT POSITIONS HERE,
10 THESE ARE POSITIONS.

11 I APOLOGIZE FOR SOME OF MY ARTISTIC
12 INEPTNESS, BUT WHEN YOU PUT A CHLORINE ON THERE YOU
13 CAN PUT -- THE CHLORINE CAN GO HERE, IT CAN GO HERE
14 OR IT CAN GO HERE.

15 AND IT COULD GO IN EQUIVALENT POSITIONS
16 IN THESE OTHER RINGS SO THEY ARE JUST MIRROR IMAGES
17 SO THEY ARE THE SAME.

18 WHAT ENDS UP BY PUTTING ONE CHLORINE ON
19 THE BIPHENYL YOU NOW HAVE WHAT IS CALLED THREE
20 ISOMERS.

21 SO THERE ARE THREE DIFFERENT MONOCHLORO
22 BIPHENYLS THAT ARE IN THE PRODUCT.

23 THAT SITUATION EVEN GETS MORE COMPLEX
24 BECAUSE AS YOU PUT TWO ON IT, YOU NOW HAVE THEM IN
25 ANY ONE OF THREE POSITIONS UP HERE PLUS THERE CAN BE
26 ONE IN EACH RING.

27 YOU END UP ON THE NEXT LEVEL.

28 YOU START OFF WITH ONE FOR BIPHENYL,

1 THREE FOR THE MONO AND THEN IT GOES TO 12 DIFFERENT
2 CHLORO BIPHENYLS.

3 Q THERE ARE 12 DIFFERENT WAYS YOU CAN
4 POSITION THE CHLORINES ON THOSE TWO RINGS?

5 A RIGHT.

6 THAT IS NOT JUST SOMETHING IN OUR HEADS.

7 EACH ONE OF THESE THINGS, IF YOU WERE TO
8 ISOLATE IT, WOULD HAVE A DIFFERENT BOILING POINT,
9 WOULD HAVE A DIFFERENT MELTING POINT, WOULD HAVE A
10 DIFFERENT CHEMICAL CHARACTERISTIC, A DIFFERENT
11 BIODEGRADABILITY, THINGS OF THAT SORT.

12 IT'S ALL DEPENDENT WHERE THE CHLORINE IS
13 LOCATED AND HOW MANY CHLORINES ARE LOCATED ON THAT
14 PARTICULAR MOLECULE.

15 THIS PROCESS GOES ON AND IT KIND OF LOOKS
16 LIKE THIS.

17 WITH FIVE CHLORINES IN THE CENTER, ZERO
18 OVER HERE AND ZERO OVER HERE.

19 Q "FIVE CHLORINES." WHAT YOUR SAYING IS
20 YOU WILL HAVE FIVE CHLORINES SITUATED IN ONE OR THE
21 OTHER LOCATIONS ON THE BIPHENYL?

22 A YES, A PENTACHLORO BIPHENYL. THIS WOULD
23 BE ZERO, ONE, TWO, THREE, FOUR, FIVE, SIX, SEVEN,
24 EIGHT, NINE, 10.

25 THERE IS ONLY ONE BIPHENYL AND THERE IS
26 ONLY ONE DECA, 10, BECAUSE YOU HAVE USED ALL THE
27 POSITIONS.

28 IT'S JUST ONE.

1 AND IN BETWEEN YOU START OUT WITH THREE,
2 12 AND IT GOES UP AND THE NUMBER OF POTENTIAL
3 DIFFERENT KINDS OF MOLECULES PEAKS AT FIVE AND THEN
4 IT DECREASES DOWN AS YOU FILL THE RINGS.

5 THERE ARE GOOD RULES IN THE AREA OF
6 CHEMISTRY, ORGANIC CHEMISTRY, THAT DESCRIBE THESE
7 THINGS.

8 THOSE ARE THINGS AGREED TO BY ALL
9 SCIENTISTS AND THAT HAVE BEEN PROVEN OVER THE LAST
10 HUNDREDS OF YEARS.

11 SO IT'S NOT LIKE IT'S JUST DREAMT UP IN
12 SOMEBODY'S HEAD.

13 Q IF YOU ADD THE COMBINATIONS UP THAT YOU
14 HAVE DISCUSSED, HOW MANY DIFFERENT PCB'S ARE THERE,
15 IF YOU WILL?

16 A OKAY. "BIPHENYL" IS NOT A PCB BECAUSE IT
17 DOESN'T CONTAIN CHLORINE.

18 SO TAKING THAT AWAY, YOU END UP WITH 209
19 ISOMERS THAT CONTAIN CHLORINE.

20 Q SO THERE ARE 209 DIFFERENT FACES, IF YOU
21 WILL, FOR PCB'S OR POTENTIALLY?

22 A THAT'S CORRECT.

23 IN ADDITION TO THAT, IT GETS EVEN MORE
24 COMPLICATED, UNFORTUNATELY, IN THE SENSE THAT THERE
25 ARE DIFFERING AMOUNTS OF EACH ONE OF THESE.

26 AND THE AMOUNT THAT -- THE AMOUNT -- THE
27 TIME THAT YOU CARRY ON THE REACTION DICTATES THE
28 DIFFERENT AMOUNTS OF THINGS.

1 SO IT'S A VERY COMPLEX SITUATION.

2 Q ALL RIGHT. AND IS THERE A RELATIONSHIP
3 BETWEEN THE WEIGHT OF A PARTICULAR PCB AND THE NUMBER
4 OF CHLORINES THAT MAY BE ON THAT PCB?

5 A YES.

6 A CARBON IS ASSIGNED IN A VALUE OF 21
7 ATOMIC MASS UNITS. THAT'S ITS WEIGHT. JUST LIKE MY
8 WEIGHT, I WOULD LIKE TO ATTEST ABOUT 165.

9 ITS WEIGHT IS 12.

10 A HYDROGEN'S WEIGHT IS ONE AND A
11 CHLORINE'S WEIGHT IS 35.

12 AND SO IF YOU HAVE 12 CARBONS IN A RING,
13 YOU HAVE 12 TIMES 12 AND SO THAT IS 144.

14 PERHAPS WE SHOULD GET A PIECE OF PAPER.

15 OKAY. AS I SAID, THIS IS C-12, H-10.
16 THAT IS WITH NO CHLORINES ON IT, OKAY?

17 AND AS WE SAID, A CARBON IS EQUAL TO 12.
18 A HYDROGEN IS EQUAL TO ONE, AND THEN AS WE WILL SEE,
19 A CHLORINE IS EQUAL TO 35.

20 SO 12 TIMES 12 IS 144 AND 10 TIMES ONE IS
21 10.

22 SO THE MOLECULAR WEIGHT OR THE ATOMIC
23 WEIGHT OF A BIPHENYL MOLECULE IS 154, OKAY?

24 SO MONOCHLORO YOU WOULD TAKE AWAY ONE
25 HYDROGEN, BECAUSE YOU WILL TAKE A HYDROGEN OFF AND
26 PUT A CHLORINE ON.

27 SO YOU WIND UP WITH 153 AND THEN YOU ADD
28 35 TO IT.

1 SO NOW THE WEIGHT OF THAT WITH ONE
2 CHLORINE ON IT IS 188 AND SO ON.

3 Q SO IF YOU ADDED ANOTHER CHLORINE, THEN
4 YOU WOULD SUBTRACT ONE FOR THE HYDROGEN AND ADD
5 ANOTHER 35?

6 A ANOTHER 35.

7 THAT IS A SIMPLIFICATION, BUT THAT IS THE
8 WAY IT WORKS.

9 SO EACH ONE OF THESE HOMOLOGS HAS A
10 SPECIFIC ATOMIC WEIGHT ASSOCIATED WITH IT, THAT IT
11 CARRIES AROUND WITH IT LIKE AN IDENTIFICATION CARD.

12 Q AND YOU CAN HAVE YOUR SEAT, NOW.

13 A THANK YOU.

14 Q DR. JENSEN AND DR. WIDMARK REPORTED
15 FINDING PCB'S, A CERTAIN TYPE, I.E. HEAVIER AS
16 OPPOSED TO LIGHTER?

17 A YES.

18 IF I REMEMBER CORRECTLY, WHAT THEY
19 REPORTED WAS THAT THEY FOUND WHAT WAS CALLED THE
20 HIGHER-CHLORINATED BIPHENYLS. "HIGHER," OF COURSE,
21 MEANS IT HAS MORE AND MORE CHLORINES ON THE BIPHENYL
22 RING.

23 I BELIEVE THEY WERE FINDING PRIMARILY
24 THINGS THAT WERE SIX AND ABOVE.

25 Q SO ON THAT LITTLE HALF MOON THAT YOU DREW
26 BEYOND THE RIGHT SIDE BETWEEN THE FIVE AND WHATEVER?

27 A CORRECT.

28 IN OTHER WORDS, THE BIPHENYL MOLECULES

1 THAT THEY WERE FINDING IN THE ENVIRONMENTAL SAMPLES
2 CONTAINED SIX OR MORE CHLORINES PER BIPHENYL
3 MOLECULE.

4 Q OKAY. NOW, WHAT IS AN AROCLOR,
5 DR. TUCKER?

6 A AN AROCLOR IS BASICALLY A POLYCHLORINATED
7 BIPHENYL.

8 AROCLOR IS A TRADE NAME THAT MONSANTO
9 CALLED "POLYCHLORINATED BIPHENYLS," A PRODUCT NAME,
10 BASICALLY.

11 Q DID IT HAVE ONE OR MORE PCB TYPES IN IT?

12 A CORRECT.

13 THERE WERE A NUMBER OF AROCLORS
14 MANUFACTURED AND AROCLORS WERE DESIGNATED. FOR
15 EXAMPLE, IF WE TALK ABOUT SOMETHING THAT WAS CALLED
16 AROCLOR 1242.

17 Q ALL RIGHT. LET'S TALK ABOUT 1242.

18 I'M TAKING THE DIAGRAM FROM 241.

19 CAN YOU SEE IT FROM WHERE YOU ARE OR NOT?

20 A YES, SIR.

21 Q OKAY.

22 A IN THAT PARTICULAR DRAWING WE HAVE SHOWN
23 TWO OF THE AROCLORS.

24 THERE IS AROCLOR 1221 AND AROCLOR 1242.

25 THE 1200, THE FIRST TWO NUMBERS IN THE
26 1221 AND THE 1242 REFER TO THE FACT THAT IT WAS A
27 BIPHENYL PRODUCT AND THAT IT WAS OF THAT SERIES.

28 THE 21, FOR EXAMPLE, IN THE FIRST COLUMN

1 WHERE IT SAYS AROCLOR 1221 REFERS TO THE FACT THAT
2 IT'S A 21-PERCENT CHLORINE BY WEIGHT, BIPHENYL,
3 AROCLOR.

4 IN THE 1242 COLUMN, WHICH IS THE ONE JUST
5 BEFORE THE END ON THE RIGHT, YOU SEE 1242.

6 IT SAYS IT'S 42 PERCENT CHLORINATED.

7 NOW, IF YOU GO BACK AND CALCULATE IT,
8 WHAT YOU WILL FIND OUT IS THAT 1242, OF COURSE,
9 CORRESPONDS TO A TRICLORO BIPHENYL AND 1221 I BELIEVE
10 OCCURS TO A MONOCHLORO BIPHENYL.

11 IF YOU WERE TO CALCULATE, TAKE THE AMOUNT
12 OF CHLORINE AND THE AMOUNT OF CARBON AND HYDROGEN AND
13 PUT IT OVER AND CALCULATE IT OUT, YOU WOULD FIND THAT
14 IT WOULD COME OUT TO 21 PERCENT FOR AROCLOR THE 12
15 PERCENT MONOCHLORS AND 42 PERCENT FOR THE
16 TRICHLOROES.

17 Q HERE YOU CAN'T SEE IT TOO WELL, BUT
18 IT'S -- THOSE ARE -- THERE IS A LIST THERE OF
19 HOMOLOGS.

20 AGAIN, THAT REFERENCED WHAT WE WERE JUST
21 DRAWING, CORRECT?

22 A RIGHT, THE NUMBERS ON THE LEFT, THE
23 VERTICAL COLUMN ON THE LEFT GO FROM ZERO TO 80.

24 AND THOSE ARE BASICALLY THE HOMOLOGS I
25 TALKED ABOUT.

26 ZERO IS A BIPHENYL. ONE IS A MONOCHLORO
27 BIPHENYL.

28 TWO, DI, UPWARDS TO THE EIGHT WHICH IS

1 OCTA.

2 Q SO THREE WOULD HAVE THREE CHLORINES ON
3 IT?

4 A RIGHT.

5 Q AND THEN YOU GO OVER TO 1242 HERE AND IT
6 HAS 16 ON THE TWO CHLORINE RINGS.

7 NOW, WHAT DOES THAT MEAN, 16?

8 A THE WAY THE PRODUCTS ARE MANUFACTURED IS
9 THAT YOU TAKE BIPHENYL AND THEN YOU PUT CHLORINE IN
10 WITH THE BIPHENYL.

11 SO THE FIRST THING THAT HAPPENS IS THAT
12 YOU FORM A MONO CHLORO BIPHENYL AND THEN YOU FORM IN
13 DIACHLOR AND TRI AND TETRA AND ALL THE ISOMERS.

14 AT SOME POINT IN TIME IF YOU WANTED A
15 21-PERCENT CHLORINATED BIPHENYL, YOU WOULD STOP THE
16 REACTION BY WITHDRAWING THE CHLORINE, NOT PUTTING
17 ANYMORE IN.

18 NOW, WHAT THAT MEANS IS THAT IF YOU LOOK
19 AT THE COLUMN, ON THE LEFT IS THE HOMOLOGS ZERO
20 THROUGH EIGHT, AND THEN YOU LOOK IN THE COLUMN UNDER
21 AROCLOR 1242, YOU WILL SEE THAT WHEN YOU ACTUALLY
22 ANALYZE THE PRODUCT, THAT IT CONTAINS LESS THAN A
23 TENTH OF A PERCENT OF BIPHENYL, 1 PERCENT MONOCHLORO
24 BIPHENYLS, 16 PERCENT DICLORO BIPHENYLS AND 49
25 PERCENT TRICHLORO BIPHENYLS AND SO ON, SUCH THAT IT,
26 THE DOMINANT ISOMER OR HOMOLOG PRESENT IN 1242 WOULD
27 BE THE TRICHLORO BIPHENYL.

28 THE REASON YOU DON'T GET PER TRICHLORO

1 BIPHENYL IS THE WAY THE REACTION IS RUN AND THE
2 CHEMISTRY INVOLVED WITH THOSE KINDS OF THINGS.

3 Q ALL RIGHT. HAVING GOTTEN YOUR
4 ASSIGNMENT, SIR, TO BEGIN TO FIND OUT WHAT WAS
5 HAPPENING IN SWEDEN, WHAT EQUIPMENT WAS AVAILABLE TO
6 YOU AT THE TIME TO BEGIN THAT ASSIGNMENT AT MONSANTO?

7 A OKAY.

8 MONSANTO HAD, AT THAT TIME, A GROUP THAT
9 DID GAS CHROMATOGRAPHY.

10 THERE WERE GAS CHROMATOGRAPHS AVAILABLE.

11 THE TYPE OF GAS CHROMATOGRAPHY THAT
12 MONSANTO DID AT THAT TIME WOULD BE CONSIDERED MACRO,
13 IN OTHER WORDS IT WAS MAINLY INTERESTED IN
14 DETERMINING PERCENT LEVEL OR ABOVE CONSTITUENTS AND
15 PRODUCTS AND THAT KIND OF THING, NOT ENVIRONMENTAL
16 REAL LOW LEVELS.

17 BUT THEY DID HAVE GAS CHROMATOGRAPHS
18 WHICH WERE THE COMMON KIND OF INSTRUMENT THAT COULD
19 BE USED FOR EITHER APPLICATION.

20 ALSO, WHEN I LOOKED INTO IT I FOUND OUT
21 THAT THERE WAS AN ELECTRON CAPTURE DETECTOR
22 AVAILABLE.

23 NOW, AN ELECTRON CAPTURE DETECTOR IS A
24 VERY SPECIAL KIND OF DETECTOR THAT YOU PUT AT THE END
25 OF THIS GAS CHROMATOGRAPH.

26 I WILL TRY TO EXPLAIN HOW THAT WORKS, IF
27 YOU WOULD LIKE ME TO.

28 THE COURT: SIR, SLOW DOWN.

1 THE WITNESS: THANK YOU VERY MUCH. I KNEW I
2 WOULD DO IT.

3 Q BY MR. PREUSS: DO YOU WANT TO START WITH
4 A DIAGRAM CALLED THE "BLACK BOX"?

5 A SURE.

6 THE FIRST THING I ACTUALLY DID WAS
7 REVIEWED THE LITERATURE AVAILABLE.

8 I THINK THERE MIGHT HAVE BEEN A GRAND
9 TOTAL OF ONE ARTICLE OR A COUPLE OF ARTICLES
10 AVAILABLE THAT DESCRIBED WHAT THESE SCIENTISTS DID
11 AND WHAT EQUIPMENT THEY USED.

12 AND I LOOKED AT THAT AND I LOOKED AT THE
13 AVAILABILITY OF THAT EQUIPMENT IN THE UNITED STATES
14 AND ALSO THE AVAILABILITY OF THAT EQUIPMENT TO ME AT
15 MONSANTO AND BEGAN TO ASSEMBLE THE KINDS OF THINGS IN
16 MY HEAD, AT LEAST, AND IN PAPER, WHAT I WOULD NEED TO
17 REPRODUCE THESE THINGS AND TO BEGIN TO DO IT.

18 AS YOU ASKED ME TO POINT OUT, WE DID HAVE
19 GAS CHROMATOGRAPHS SO WE HAD THAT AND WE DID HAVE A
20 DETECTOR, AS I INDICATED EARLIER, THAT IS AN ELECTRON
21 CAPTURE DETECTOR WHICH IS A VERY SPECIFIC KIND OF
22 DETECTOR THAT IS GOOD FOR DETECTING CHLORINATED
23 HYDROCARBONS WHICH PESTICIDES AND PCB'S ARE.

24 Q RIGHT.

25 NOW, DR. TUCKER, WHAT TYPE OF EQUIPMENT
26 DID YOU LEARN THAT DRS. JENSEN AND WIDMARK HAD USED
27 TO REPORT THEIR FINDINGS OR OBTAIN THEIR FINDINGS
28 WHICH THEY REPORTED?

1 A THERE WAS A DIFFERENCE BETWEEN THE
2 EQUIPMENT WE HAD AND THE EQUIPMENT THAT PESTICIDE
3 ANALYTICAL CHEMISTS USED.

4 THE EQUIPMENT WE HAD WAS NOT CONSIDERED
5 WHAT YOU CALL A BIOMEDICAL GAS CHROMATOGRAPH.

6 AND THE PEOPLE IN THE PESTICIDE AREA,
7 SINCE THEY DEALT WITH THE ISSUES AND WITH
8 ENVIRONMENTAL SAMPLES, THINGS OF THAT SORT, USED
9 BIOMEDICAL GAS CHROMATOGRAPHS AT THAT TIME AND NOT
10 PROCESS TYPE GAS CHROMATOGRAPHS.

11 SO THERE WAS THAT DIFFERENCE, BUT THEY
12 WERE BASICALLY THE SAME THING.

13 IF I MAY, I CAN --

14 Q SURE.

15 A -- TRY.

16 A CHROMATOGRAPH IS BASICALLY AN OVEN,
17 OKAY?

18 AND INSIDE THAT OVEN IS A GLASS COLUMN, A
19 TUBE, OKAY?

20 AND INSIDE THAT TUBE IS A SOLID MATERIAL
21 LIKE SAND.

22 THAT TUBE IS FILLED WITH SAND.

23 Q IS THIS A HOLLOW TUBE?

24 A YES, YES.

25 Q AND IT'S WOUND UP IN CONCENTRIC CIRCLES?

26 A LIKE THIS SO YOU DON'T HAVE IT STRETCHING
27 OVER.

28 YOU GET IT DOWN INTO A SMALL AREA.

1 THE SAND OR THE SOLID SUPPORT THAT YOU
2 PUT IN THERE, BEFORE YOU PUT IT IN THERE, YOU COAT IT
3 WITH WHAT IS CALLED THE LIQUID PHASE.

4 SO THE PARTICLES THAT ARE IN THIS ARE
5 COATED WITH A LIQUID PHASE.

6 Q YOU ARE TALKING ABOUT THE INSIDE DIAMETER
7 OF THE COLUMN?

8 A THE PACKING THAT IS IN THE COLUMN, YES,
9 SIR.

10 Q OKAY.

11 A AND WHAT IT DOES IS, IT PUTS THE THING
12 THAT IS GOING TO DO WHAT WE CALL THE SEPARATION ON A
13 HIGH SURFACE AREA SO YOU CAN PERFORM GAS
14 CHROMATOGRAPHY, GAS LIQUID CHROMATOGRAPHY.

15 ONCE YOU PUT THE SAND IN HERE THAT HAS
16 BEEN TOTALLY COATED WITH THIS LIQUID AND PUT IT IN
17 HERE, YOU PACK IT IN, THIS BECOMES WHAT IS CALLED AN
18 INLET.

19 AND THEN, THIS, OF COURSE, IS THE EXIT.

20 AND ON THIS EXIT YOU CONNECT THIS TO A
21 DEVICE THAT CAN DETECT WHAT YOU PUT ON THE FRONT HERE
22 AND WHAT COMES OUT THE OTHER END, OKAY?

23 THE PCB, AFTER YOU GET IT INTO THE
24 APPROPRIATE SOLUTION OR WHATEVER YOU CALL IT, CAN BE
25 INJECTED ON THE FRONT END OF THIS.

26 NOW, ALSO I FORGOT TO MENTION THAT THERE
27 IS A THING CALLED THE CARRIER GAS THAT IS FLOWING
28 THROUGH HERE AT ALL TIMES.

1 IT'S LIKE HELIUM AND IT'S UNDER HIGH
2 PRESSURE, 30, 40, 50 POUNDS PER SQUARE INCH AND IT
3 FLOWS THROUGH HERE AT A RATE OF, SAY, 30 TO 50
4 MILLION PER MINUTE.

5 SO YOU HAVE GAS CONTINUOUSLY SWEEPING
6 THROUGH THIS AND THEN YOU HAVE THIS OVEN THAT HEATS
7 IT UP TO A HOT TEMPERATURE, OKAY?

8 THAT IS A GAS CHROMATOGRAPH.

9 THE OBJECTIVE, OF COURSE IS TO TAKE THE
10 PCB'S, INJECT THEM INTO THE GAS CHROMATOGRAPH,
11 VAPORIZE THEM INTO A GAS AND THEN PASS THIS GAS
12 THROUGH THIS COLUMN AND WHEN IT GOES THROUGH THIS
13 COLUMN THE PCB'S, BECAUSE OF THEIR CHEMICAL
14 CHARACTERISTICS, MONOS OR DIFFERENT ENTRIES, THINGS
15 OF THAT SORT, ARE HELD UP BY THIS LIQUID PHASE, SUCH
16 THAT INSTEAD OF COMING OFF AS ONE BIG LUMP IT COMES
17 OFF AS DISCREET PEAKS THAT HAVE TAKEN DIFFERENT TIMES
18 TO TRAVEL THROUGH THIS SEPARATION.

19 Q WHEN YOU SAY "PEAKS," THEY ARE COMING OUT
20 ON A GRAPH OF SOME SORT?

21 A YOU ARE COMING ALONG.

22 THERE IS NOTHING THERE.

23 THEN SUDDENLY SOME OF THE MOLECULES COME
24 OUT, THEN MORE AND MORE AND MORE AND YOU REACH A PEAK
25 AND THE POPULATION DECREASES AND THEN SOME MORE OF
26 THIS OTHER KIND COMES OUT AND LIKE THAT.

27 IT'S LIKE THEY COME OUT AND OUT.

28 SO THEY ARE JUST DRIVING THROUGH HERE AND

1 COMING OUT THE OTHER END.

2 THIS DETECTOR, IT'S AN ELECTRON CAPTURE
3 DETECTOR, IS A WAY OF SEEING THESE PEAKS.

4 THE UNIQUE THING ABOUT THE ELECTRONIC
5 CAPTURE DETECTOR IT ONLY SEES CHLORINATED
6 HYDROCARBONS, PESTICIDES OR PCB'S THAT HAVE CHLORINE
7 IN THEM.

8 Q WHEN YOU STARTED WAS THE ELECTRON CAPTURE
9 DETECTOR PART OF THE EXISTING GAS CHROMATOGRAPH?

10 A IT REALLY HADN'T BEEN INSTALLED.

11 IT HAD BEEN PURCHASED BECAUSE PEOPLE FELT
12 THAT THEY SHOULD KIND OF HAVE ONE OF THEM.

13 ANALYTICAL CHEMISTS ARE LIKE PLUMBERS,
14 THEY LIKE TO HAVE ONE OF EACH OF THE KIND OF WRENCHES
15 THEY MIGHT NEED. THEY BUY A WRENCH AND DON'T USE IT
16 FOR A PERIOD OF TIME BUT WOULD YOU LIKE TO HAVE IT.

17 IT WAS THAT KIND OF SITUATION.

18 HERE CAME A SITUATION WHERE WE NEEDED TO
19 USE IT AND IT WAS VERY FORTUNATE WE HAD IT.

20 WE PUT IT TOGETHER AND DID PRELIMINARY
21 INVESTIGATION TO GET STARTED ON THE PROGRAM AS SOON
22 AS POSSIBLE WITH THAT INSTRUMENT, EVEN THOUGH IT
23 WASN'T EXACTLY EQUIVALENT TO WHAT THE PESTICIDE THE
24 ANALYTICAL CHEMIST USED.

25 Q NOW, DID DRS. WIDMARK AND JENSEN ALSO USE
26 A DEVICE KNOWN AS A MASS SPECTROMETER?

27 A CORRECT.

28 UP UNTIL --

1 Q DID MONSANTO HAVE ONE OF THOSE?

2 A NO, WE DID NOT. WE DID NOT.

3 AND UP UNTIL THAT POINT IN TIME MASS
4 SPECTROMETERS WERE NOT VERY COMMON INSTRUMENTS.

5 AND THEY WERE CERTAINLY NOT USED AS GAS
6 CHROMATOGRAPH DETECTORS.

7 THEY WERE USED IN A VERY DIFFERENT
8 FASHION, ALMOST EACH ONE WAS HAND BUILT AND THEY COST
9 UPWARDS OF \$250,000.

10 SO YOU HAD TO HAVE REAL GOOD REASONS FOR
11 WANTING TO HAVE ONE.

12 Q 250,000 IN THOSE DAYS?

13 A YES. YES.

14 THEY USED THE ELECTRON CAPTURE DETECTORS
15 AND THEY ALSO USED A MASS SPECTROMETER.

16 Q "THEY" BEING JENSEN AND WIDMARK?

17 A JENSEN AND WIDMARK, YES.

18 AT THAT POINT IN TIME THEY WERE ON THE
19 LEADING EDGE OF TECHNOLOGY.

20 THEY WERE ALMOST THE ONLY PEOPLE. AND I
21 SAY "ALMOST" BECAUSE I CAN'T SWEAR THAT THEY WERE THE
22 ONLY PEOPLE, ALMOST THE ONLY PEOPLE, CERTAINLY THE
23 ONLY PEOPLE I KNEW THAT WERE DOING GAS CHROMATOGRAPHY
24 AND USING A MASS SPECTROMETER IN CONNECTION WITH IT.

25 Q WHAT ADDITIONAL ASSISTANCE DID THE MASS
26 SPECTROMETER ADD TO THE ANALYTIC ENDEAVOR, SIR?

27 A THE MASS SPECTROMETER IS THE ONLY
28 ANALYTICAL DETECTION TECHNIQUE THAT ABSOLUTELY

1 IDENTIFIES WHAT YOU ARE DEALING WITH.

2 IT'S LIKE -- IT FINGERPRINTS.

3 IT'S LIKE YOUR FINGERPRINTS ARE DIFFERENT
4 THAN EVERYONE ELSE'S THERE.

5 IT DOES THAT FOR MOLECULES.

6 Q AND DID MONSANTO ACQUIRE A MASS
7 SPECTROMETER?

8 A YES, WE DID.

9 Q OKAY. HAD ONE BEEN ORDERED BY THE TIME
10 YOU GOT THERE?

11 A THERE WAS ONE ORDERED PRIOR TO MY
12 ACTUALLY ARRIVING, I BELIEVE.

13 Q OKAY. TELL US, IF WOULD YOU, PLEASE,
14 WHAT YOUR INITIAL WORK WAS, WORKING WITH THE
15 CHROMATOGRAPH THAT WAS THERE AND THE ECD THAT WAS
16 THERE, THE ELECTRON CAPTURE DEVICE?

17 A AS I MENTIONED, YOU HAVE TO GET THE PCB'S
18 IN SUITABLE FORM TO INTRODUCE IT INTO THIS
19 SEPARATION, MOLECULAR SEPARATION SYSTEM AND DETECTION
20 SYSTEM.

21 AND THE WAY GAS CHROMATOGRAPHS ARE
22 DESIGNED IT MEANS THAT YOU USE ALL THE THINGS OF
23 INTEREST IN A SOLVENT, LIKE HEXANE.

24 NOW, THE CLOSEST I COULD TELL YOU IS
25 HEXANE IS IT'S LIKE GASOLINE EVEN THOUGH IT'S A PURE
26 CONSTITUENT.

27 SOME WAY OR ANOTHER YOU HAVE TO TAKE THIS
28 ENVIRONMENTAL SAMPLE, PULL THE PCB'S OUT OF IT AND

1 THROW AWAY EVERYTHING ELSE AND GO BETWEEN A BUNCH OF
2 THINGS HERE AND END UP WITH THE PCB'S AND OTHER
3 THINGS OF INTEREST IN THIS SOLVENT SYSTEM THAT IS
4 SUITABLE FOR INTRODUCTION INTO THIS GAS
5 CHROMATOGRAPH.

6 SO THE FIRST STEP, IN ADDITION TO SETTING
7 UP THIS INSTRUMENT WHICH WOULD ALLOW US TO SEE WHAT
8 WE ARE DOING, WAS TO THEN BEGIN TO DESIGN, YOU KNOW,
9 TECHNIQUES THAT WOULD ALLOW US TO EXTRACT PCB'S FROM
10 WATER, FROM AIR, FROM THE ISSUES, FROM SLUDGES, FROM
11 SEDIMENTS, FROM ALL KINDS OF SAMPLES AND ULTIMATELY
12 GET IT INTO A FORMAT THAT WE CAN PUT IT INTO THIS
13 INSTRUMENT AND SEE IF IT WAS THERE AND HOW MUCH WAS
14 THERE.

15 THE FIRST STEP IN THAT KIND OF PROCEDURE
16 IS HERE IS YOUR SAMPLE WHICH, AS I SAID, COULD BE
17 DIRT, IT COULD BE HAIR, IT COULD BE FAT, IT COULD BE
18 MUSCLE, IT COULD BE A FISH. IT COULD BE, YOU KNOW,
19 ANY OF THOSE KINDS OF THINGS.

20 IS TO TAKE THIS SAMPLE AND EXTRACT IT AND
21 SEPARATE WHAT YOUR INTERESTED IN, IN THIS CASE WE
22 WERE INTERESTED IN PCB'S, FROM THE BULK OF THE
23 SAMPLE.

24 AND THIS PARTICULAR STEP IS USUALLY
25 INVOLVES TAKING A SOLVENT EXTRACTION, MIXING THE SOIL
26 WITH IT OR A SOLVENT THAT IS NOT MIXABLE WITH THE
27 WATER, SHAKING IT AND THEN SHAKING THE TWO OR, IF YOU
28 ARE LOOKING AT -- ROCKS, YOU WOULD MIX IT WITH THIS

1 SOLVENT AND THEN FILTER OUT THE ROCKS AND COLLECT THE
2 SOLVENT.

3 SO THIS FIRST EXTRACTION STEP ISOLATES A
4 GROUP OF CONSTITUENTS THAT HAVE SIMILAR PROPERTIES,
5 SIMILAR SOLUBILITY IN THE SOLVENTS FROM THE ROCKS.

6 YOU END UP WITH, SAY, YOU LEAVE 99.9
7 PERCENT OF THE MATRIX OR SAMPLE BEHIND AND YOU BRING
8 FORWARD ABOUT 0.1 OF WHAT IS IN THERE BY SELECTIVELY
9 DISSOLVING IT OUT, OKAY?

10 AT THAT POINT IN TIME YOU HAVE GOT, IF
11 YOU HAVE DONE IT CORRECTLY, YOU HAVE GOT WHAT YOU'RE
12 LOOKING FOR BUT YOU ALSO, PROBABLY HAVE SOME OTHER
13 THINGS THERE LIKE CHLORINATED PESTICIDES, FOR
14 EXAMPLE, DDT OR ANY OTHER KIND OF WHAT WE CALL
15 CHLORINATED HYDROCARBONS ALSO WOULD BE IN THERE
16 BECAUSE THEY HAVE SIMILAR PROPERTIES AND SO THEY ARE
17 CARRIED ALONG.

18 HYDROCARBONS, IN GENERAL, HAVE SIMILAR
19 PROPERTIES.

20 AS I SAID, BIPHENYLS AS A HYDROCARBON.
21 THEY ARE CARRIED ALONG TOO.

22 SO YOU END UP WITH A 10TH OF A PERCENT OF
23 MATERIAL OF WHICH A VERY, VERY SMALL AMOUNT COULD BE
24 PCB'S.

25 Q AND THAT IS YOUR EXTRACT?

26 A YES, SIR.

27 AN THEN AT THIS POINT YOU TAKE THAT
28 FORWARD AND THEN YOU USE OTHER KINDS OF SEPARATION

1 TECHNIQUES THAT I WILL REFER TO AS MACRO SEPARATION
2 AND YOU MIGHT DO THINGS LIKE TREAT IT WITH ACID AND
3 ANY COMPOUNDS THAT WERE -- REACTED WITH THE ACID
4 WOULD DISAPPEAR, WHEREAS YOU KNOW, PCB'S DON'T REACT
5 WITH THE ACIDS SO THEY WOULD STAY THERE.

6 YOU MIGHT TREAT IT WITH BASE.

7 YOU MIGHT RUN IT THROUGH ANOTHER KIND OF
8 CHROMATOGRAPHIC MEDIA THAT WOULD THROW AWAY SOME
9 OTHER CONSTITUENTS YOU WEREN'T INTERESTED IN, FOR
10 EXAMPLE FATS, HUMIC ACID, THINGS NORMALLY PRESENT IN
11 ENVIRONMENTAL SAMPLES.

12 THE WHOLE THING IS THESE ARE CALLED
13 CLEAN-UP.

14 Q WHAT ARE YOU TRYING TO ACCOMPLISH WITH
15 THE CLEAN-UP OF THE EXTRACTS?

16 A IT'S KIND OF LIKE A PYRAMID, YOU KNOW?
17 WE DON'T WANT THE JUNK. IT MAY BE
18 SOMEBODY ELSE'S GOOD JUNK BUT IT'S JUNK.

19 SO WHAT WE ARE TRYING TO DO IS THROW AWAY
20 ALL THE THINGS THAT WE DON'T WANT AND ONLY GET WHAT
21 WE WANT.

22 THE REASON FOR THAT IS THAT IF YOU HAVE A
23 LOT OF OTHER CONSTITUENTS IN THERE THAT HAVE SIMILAR
24 PROPERTIES TO WHAT WE ARE LOOKING FOR, THOSE
25 DETECTION SYSTEMS WILL SEE THOSE TWO AND THEY WILL
26 CONFUSE YOU.

27 THE OBJECTIVE IS TO BE AS UNCONFUSED AS
28 POSSIBLE WHEN YOU SAY SOMETHING IS THERE AND HOW MUCH

1 IS THERE.

2 Q OKAY. SO NOW YOU HAVE CLEANED UP THE
3 SAMPLE?

4 A CORRECT.

5 AND ONCE THE SAMPLE IS CLEANED UP, THEN
6 YOU HAVE TO CONCENTRATE IT.

7 Q WHAT DOES THAT MEAN?

8 A WELL, IT MEANS THAT YOU MAY TAKE, OH,
9 SEVERAL HUNDRED MILLIMETERS OR A LITER OR A QUART OF
10 SOLVENT AND SHAKE IT WITH THE SOIL AND THEN RUN IT
11 THROUGH THESE THINGS AND YOU END UP WITH THIS QUART
12 OF SOLVENT.

13 YOU CAN'T PUT THE WHOLE QUART OF SOLVENT
14 IN THE INSTRUMENT.

15 THE INSTRUMENT ONLY TAKES A VERY SMALL
16 AMOUNT.

17 WE CALL IT MICROLITERS.

18 YOU TAKE THE SOLVENT AND YOU EVAPORATE
19 THE SOLVENT AND SINCE THE PCB'S AND OTHER
20 CONSTITUENTS YOU ARE INTERESTED IN ARE SUCH HIGH
21 BOILERS, THE SOLVENT DISAPPEARS AND YOU END UP WITH A
22 VERY SMALLER AMOUNT OF THE SOLVENT WITH THE PCB'S AND
23 THE CONSTITUENTS OF INTEREST IN THERE.

24 SO THAT IS CALLED CONCENTRATING. BUT IT
25 ALSO INCREASES THE AMOUNT THAT YOU CAN DELIVER TO THE
26 INSTRUMENT WHICH GETS YOU SO YOU CAN ACTUALLY DETECT
27 THESE VERY ULTRA-LOW LEVELS.

28 AND THAT IS A CONCENTRATION STEP.

1 AFTER THE CONCENTRATION STEP THAT IS WHEN
2 YOU ARE FINALLY READY TO INJECT IT INTO THIS
3 INSTRUMENT AND PERFORM, REMEMBER I SAID THIS IS KIND
4 OF LIKE A MACRO SEPARATION, HERE YOU PERFORM A
5 MOLECULAR SEPARATION.

6 HERE YOU BEGIN TO SORT CLASSES OF
7 COMPOUNDS FROM EACH OTHER AND MOLECULES FROM EACH
8 OTHER.

9 WITH THIS GC INSTRUMENT.

10 THEN YOU DETECT IT OVER HERE.

11 Q NOW, DO YOU HAVE TO, WHEN YOU GET
12 SOMETHING OUT AND IT HAS ALL OF THESE PEAKS, HOW DO
13 YOU KNOW WHAT YOU'RE LOOKING AT?

14 A OKAY.

15 THE WAY YOU KNOW WHAT YOU ARE LOOKING AT
16 WITH THESE KIND OF TECHNIQUES, THE ELECTRON CAPTURE
17 IS OF A KNOWN SAMPLE OF THE MATERIAL.

18 YOU HAVE A KNOWN POLYCHLORINATED
19 BIPHENYL, SOMETHING YOU KNOW IS POLYCHLORINATED
20 BIPHENYL THAT YOU MADE.

21 AND YOU USE THAT AS A STANDARD AGAINST
22 WHICH YOU MEASURE THE THINGS THAT YOU SEE.

23 Q WHEN YOU STARTED YOUR WORK, DID YOU KNOW
24 WHAT ALL THESE PARTICULAR PCB'S LOOKED LIKE?

25 A NOT EXACTLY.

26 SO WE HAD TO ESTABLISH WHAT THEY LOOKED
27 LIKE.

28 AND WHAT YOU DO, WHAT I WOULD DO AS AN

1 ANALYTICAL CHEMIST, WHEN I START OUT DEVELOPING A
2 STANDARD OPERATING PROCEDURE OR METHOD FOR DETECTING
3 SOMETHING IS I TAKE KNOWN MATERIAL AND AT THIS POINT
4 I WOULD TAKE A SAMPLE THAT I KNEW DIDN'T CONTAIN
5 ANYTHING, IT MAY BE PURE SAND, AND I WOULD ADD THE
6 PCB TO IT.

7 AND THEN I WOULD RUN IT THROUGH THIS
8 WHOLE PROCEDURE AND THEN PUT THAT INTO THE INSTRUMENT
9 AND TAKE A LOOK AT IT.

10 BUT EVEN BEFORE THAT I WOULD TAKE JUST
11 THE PCB ITSELF AND DISSOLVE IT IN THE SOLVENT THAT I
12 HAVE HERE AND INJECT THAT IN AND CALIBRATE THE
13 INSTRUMENT AND YOU END UP KNOWING EXACTLY WHAT THE
14 RESPONSE OF THE INSTRUMENT IS TO THE PCB'S AND WHAT
15 THIS PEAK, WHAT THIS CURVE LOOKS LIKE WHEN IT COMES
16 OUT, SO THAT YOU CAN THEN TAKE THAT INFORMATION AND
17 LOOK AT AN UNKNOWN YOU HAVE RUN THROUGH AND MAKE A
18 DECISION AS TO WHETHER OR NOT PCB'S ARE THERE AND HOW
19 MUCH.

20 Q WHEN YOU SAY YOU WOULD DO THAT, IS THAT,
21 IN FACT, WHAT YOU DID WHEN YOU STARTED THE PROJECT --

22 A THAT IS CORRECT.

23 Q -- IN EARLY '68?

24 A THAT IS CALLED METHODS DEVELOPMENT IN OUR
25 ROUTINE.

26 THAT IS THE WAY YOU DEVELOP A METHOD FOR
27 MEASURING THINGS.

28 Q AND DID IT TAKE YOU SOME TIME, THEN, TO

1 DEVELOP THESE METHODS AFTER YOU GOT THE MACHINE,
2 HOOKED IT UP WITH THE ELECTRON CAPTURE DEVICE AND
3 THEN BEGAN DEVELOPING YOUR METHODS?

4 A YES, IT'S A VERY COMPLEX PROCEDURE.

5 Q CAN YOU RUN IT THROUGH THE STEPS YOU TOOK
6 IN THE ABC'S OF HOW YOU DEVELOPED THE METHOD TO THE
7 POINT WHERE YOU WERE READY TO TRY IT WITH A SAMPLE
8 FROM THE ENVIRONMENT, SUCH AS THE WATER OR SOIL OR
9 SLUDGE OR WHATEVER?

10 A OKAY.

11 FIRST OF ALL WE HAD TO OBTAIN THE
12 EQUIPMENT WHICH WAS THE GC, GET IT UP AND OPERATIONAL
13 AND HOOK IT UP TO AN ELECTRON CAPTURE DETECTOR.

14 Q THAT YOU HAD THERE WHEN YOU STARTED?

15 A RIGHT.

16 BUT YOU STILL HAVE TO PUT THEM TOGETHER,
17 THEN HAVE TURNED THEM ON, RUN THE GAS THROUGH IT,
18 PACK THE COLUMN, PUT THE COLUMN IN IT AND THEN CHECK
19 IT TO MAKE SURE IT'S WORKING.

20 IT'S NOT -- IT'S LIKE A CAR IN A SENSE.
21 THERE ARE A LOT OF MOVING PARTS AND ALL OF THOSE
22 THINGS HAVE TO WORK BEFORE YOU CAN START DRIVING ON
23 DOWN THE ROAD.

24 Q OKAY.

25 A SO YOU WOULD HAVE TO SET UP THIS.

26 THE NEXT THING YOU HAD TO DO WAS LOOK AT
27 WHAT OTHER PEOPLE HAD DONE. BECAUSE WE DON'T
28 REINVENT THE WHEEL.

1 IF WE CAN SAVE TIME, TIME IS MONEY.

2 IF WE CAN SAVE TIME BY USING OTHER
3 PEOPLE'S APPROACHES, THINGS WE HAVE ALREADY
4 DISCOVERED, WE DO THAT.

5 SO I REVIEWED SOREN JENSEN'S WORK AND
6 LOOKED AT THE ISOLATION EXTRACTION, CLEAN-UP
7 PROCEDURES THAT THEY EMPLOYED.

8 AND THEN BEGAN TO SET THOSE UP IN OUR
9 LABORATORIES.

10 THE FIRST THING YOU DO, OF COURSE, IS TO
11 GET SOME STANDARDS AND THAT WAS VERY EASY FOR US
12 SINCE WE MANUFACTURED THE MATERIAL.

13 Q SO WOULD YOU TAKE SOME 1242, FOR EXAMPLE,
14 OR WHAT HAVE YOU?

15 A YES.

16 IN ACTUALITY WHAT I DID WAS I HAD LARGE
17 QUANTITIES OF EACH OF THE AROCLORS WE MANUFACTURED,
18 SPECIFICALLY DRUMMED FOR ME WITH ALL OF THE CHAIN OF
19 CUSTODY AND EVERYTHING ASSOCIATED WITH IT SO WE WOULD
20 ALWAYS BE DEALING WITH THOSE AND WE WOULD HAVE A GOOD
21 BENCHMARK AS TO WHERE WE CAME FROM.

22 THAT IS ANOTHER STANDARD OF PRACTICE FOR
23 STANDARDS.

24 STANDARDS ARE VERY IMPORTANT IN THE
25 BUSINESS.

26 AND THEN WE USED THOSE MATERIALS, THEN,
27 TO DEVELOP THE TECHNIQUES.

28 Q ABOUT HOW LONG DID IT TAKE YOU TO GET THE

1 MACHINE ITSELF SETUP, THE EXISTING MACHINE WITH THE
2 EXISTING ELECTRON CAPTURE DEVICE?

3 A PROBABLY ON THE ORDER OF SEVERAL WEEKS.

4 Q AND THEN YOU WENT ABOUT ESTABLISHING YOUR
5 SAMPLES OR YOUR STANDARDS?

6 A CORRECT.

7 Q FROM NON-SAMPLES?

8 A CORRECT.

9 YOU TAKE THE NEAT PURE AROCLORS AND PLACE
10 THEM OUT IN A POT.

11 ADD A MEASURED AMOUNT OF SOLVENT TO THAT
12 AND THEN RUN SERIAL DILUTIONS OF THAT TO GET THE PURE
13 CONSTITUENT DOWN TO THE POINT WHERE IT WAS AT THE
14 PART-PER-TRILLION LEVEL IN THAT SOLUTION.

15 THEN WE TAKE THE PART-PER-TRILLION
16 STANDARDS AND INJECT THEM IN THE INSTRUMENT AND SEE
17 WHAT CAME OUT THE OTHER SIDE.

18 WHAT WOULD COME OUT THE OTHER SIDE IS
19 CALLED A GAS CHROMATOGRAM.

20 WHAT THIS IS IS A RESPONSE, I WILL PLOT
21 THIS AS A GRAPH.

22 YOU HAVE RESPONSE HERE AND THEN YOU HAVE
23 TIME HERE.

24 SO AS THE THINGS WENT THROUGH THE GC,
25 THEY TAKE TIME TO GO THROUGH THE GC.

26 SOME CAME OUT EARLIER THAN OTHERS.

27 YOU END UP WITH WHAT IS CALLED A
28 CHROMATOGRAM WHICH WOULD LOOK LIKE THAT.

1 AS I SAID, IT TAKES THE PCB WHICH IS ONE
2 AND SEPARATES IT INTO A LOT OF CONSTITUENTS.

3 SO YOU GET THIS OUT.

4 YOU DO ALL OF THIS IN A REPRODUCEABLE
5 FASHION SO THE NEXT TIME YOU INJECTED THIS YOU GET
6 EXACTLY THE SAME THING WITHIN LIMITS.

7 IF YOU INJECTED SOMETHING ELSE, YOU DON'T
8 GET THIS.

9 IF SO, THAT IS THE WAY YOU TELL WHETHER
10 OR NOT YOU GOT WHAT YOU GOT.

11 IN ADDITION TO THAT WHAT I PUT OVER HERE,
12 THIS IS WITH TIME HERE.

13 I PUT A RESPONSE.

14 THE AMOUNT OF RESPONSE YOU GET IS
15 RELATIVE TO THE AMOUNT OF TIME YOU PUT IN THE
16 INSTRUMENT. THAT IS THE WAY YOU ESTIMATE THE
17 CONCENTRATION.

18 IF I WOULD PUT TWICE AS MUCH OF THE
19 MATERIAL IN THE INSTRUMENT, I WOULD END UP WITH A
20 CHROMATOGRAM THAT LOOKED LIKE THIS AND SO ON.

21 AND EVENTUALLY YOU DID ACTUALLY, VIA
22 CONCENTRATION OF THEOREM OF CALIBRATION VERSUS
23 RESPONSE TO, USE THAT TO DETERMINE EXACTLY WHAT IS IN
24 THE SOLUTION.

25 Q HOW LONG DID IT TAKE YOU TO DETERMINE THE
26 STANDARDS SO YOU KNEW WHAT YOU WERE LOOKING AT WAS IN
27 FACT WHAT YOU PUT?

28 A TO BEGIN TO DO THIS KIND OF GOOD STUFF

1 WAS A SEVERAL-WEEK ROUTINE.

2 AND THIS KIND OF THING IS, LIKE
3 RACQUETBALL IS ONE OF MY FAVORITE SPORTS.

4 IT'S KIND OF LIKE RACQUETBALL.

5 WHEN YOU FIRST START OUT PLAYING
6 RACQUETBALL YOU HAVE TO THINK THROUGH EVERY SHOT, YOU
7 ARE NOT SURE HOW IT'S GOING TO WORK SO IT'S A SLOW
8 PROCESS.

9 ULTIMATELY DOWN THE ROAD, A LONG PERIOD
10 OF TIME, AS YOU PRACTICE MORE IT BECOMES AUTOMATIC
11 AND SOMETHING WHICH YOU CAN DO WITH A GREAT DEAL OF
12 CONFIDENCE AND DO QUICKLY.

13 AT THIS STAGE OF THE GAME WE WERE JUST
14 WALKING ON COURT AND WE DIDN'T KNOW HOW TO PLAY
15 RACQUETBALL VERY WELL.

16 IT TAKES A LITTLE LONGER.

17 IT'S AN ONGOING PROCESS. THE MORE YOU
18 PRACTICE RACQUETBALL, THE BETTER YOU GET AT IT. THAT
19 NEVER QUITS, QUITE FRANKLY, EVEN TODAY.

20 Q USING YOUR RACQUETBALL ANALOGY, AT THAT
21 POINT IN TIME WAS RACQUETBALL A SPORT WHERE YOU COULD
22 GRAB INSTRUCTORS ANYWHERE YOU WANTED TO?

23 A NO, IN ADDITION TO LEARNING HOW TO PLAY
24 THE GAME WE HAD TO MIX-UP SOME OF THE RULES. THAT IS
25 WHAT RESEARCH AND DEVELOPMENT WAS ALL ABOUT. THAT IS
26 WHAT WE WERE IN.

27 WE HAD TO LEARN HOW BEST TO DO IT.

28 THE COURT: EXCUSE ME, MR. PREUSS, BUT THE

1 REFEREE WILL CALL A TIME OUT.

2 WE WILL TAKE THE MORNING BREAK NOW,
3 LADIES AND GENTLEMEN, AND RESUME AT 11:00 O'CLOCK.

4 PLEASE RETURN AT THAT TIME.

5 (RECESS.)

6 THE COURT: AND RESUMING.

7 GO AHEAD, MR. PREUSS.

8 MR. PREUSS: THANK YOU, YOUR HONOR.

9 Q DR. TUCKER, WHEN WE BROKE OFF WE WERE
10 TALKING ABOUT HAVING SET UP THE EXISTING GC AND ECD
11 AND WORKING ON SOME KNOWN SAMPLES FROM STANDARDS SO
12 YOU COULD HAVE STANDARDS TO WORK BY.

13 DID YOU FIND THAT THE EXISTING GC YOU
14 WERE USING WAS GOING TO SATISFY YOUR NEEDS IN
15 CONDUCTING THIS INVESTIGATION?

16 A ACTUALLY, NO.

17 WHAT WE HAD DECIDED WAS THAT RATHER THAN
18 HAVE ONE OF THE MORE PROCESS TYPE GC INSTRUMENTS THAT
19 WERE USED FOR PRODUCT ANALYSIS THAT WE NEEDED TO
20 REALLY HAVE WHAT WAS CALLED A BIOMEDICAL TYPE GAS
21 CHROMATOGRAPH.

22 AND THAT WAS THE KIND OF GAS
23 CHROMATOGRAPH THAT USED VERY SPECIAL GLASS COLUMNS
24 AND HAD A SPECIAL KIND OF INJECTION PORTS TO PREVENT
25 BIOLOGICAL MOLECULES FROM DECOMPOSING AND CAUSING
26 PROBLEMS.

27 WE FELT SINCE THAT WAS THE STATE OF THE
28 ART, WHICH WASN'T VERY FAR ALONG, ACTUALLY, IT WAS

1 THE STATE OF THE ART, THAT WE SHOULD HAVE AS CLOSE TO
2 WHAT EVERYBODY WAS USING AS WE SHOULD IN THIS AREA.

3 SO WE HAD ORDERED ANOTHER BIOMEDICAL GAS
4 CHROMATOGRAPH EQUIPPED WITH ELECTRON CAPTURE
5 DETECTORS.

6 Q ABOUT WHEN WAS THAT DONE?

7 A THAT WAS PROBABLY DONE IN, I BELIEVE,
8 SHORTLY AFTER I GOT THE ASSIGNMENT IN 1967, THE
9 LATTER PART OF 1967.

10 Q AFTER YOU HAD SPENT SOME TIME TAKING A
11 LOOK AT THE EXISTING GC AND EC?

12 A YES.

13 IT'S NOT LIKE THERE WAS ONLY ONE
14 BIOMEDICAL GAS CHROMATOGRAPH.

15 THERE WERE A NUMBER OF MANUFACTURERS, ALL
16 THE EUROPEAN MANUFACTURERS AS WELL AS U.S.
17 MANUFACTURERS.

18 IT WAS UP TO ME WITH THE HELP OF OTHERS
19 TO MAKE SURE WE WERE GETTING THE APPROPRIATE KIND OF
20 EQUIPMENT AND THEN ALSO IT WAS IMPORTANT WHERE YOU
21 COULD BUY THINGS IN THE UNITED STATES WHERE YOU COULD
22 GET GOOD SERVICE AND GOOD PARTS AND JUST GOOD
23 EVERYTHING.

24 Q AND DID IT TAKE A PERIOD OF TIME TO GET
25 THE GC ONCE YOU DECIDED ON THE ONE YOU WANTED?

26 A CORRECT.

27 IN GENERAL, DELIVERY TIMES QUOTED BY
28 MANUFACTURERS ARE SIX TO EIGHT WEEKS, AS A GENERAL

1 RULE.

2 YOU CAN SPEED THEM UP A LITTLE BIT
3 SOMETIMES BUT SIX TO EIGHT WEEKS.

4 Q AND ONCE YOU GOT THE NEW GC WITH ELECTRON
5 CAPTURE DETECTOR, DID IT TAKE SOME TIME TO GET IT
6 SETUP?

7 A CORRECT.
8 THE INSTRUMENT WOULD HAVE TO BE SET UP.
9 YOU WOULD HAVE TO PUT THE COLUMNS IN IT.

10 Q WHEN.
11 YOU SAY "YOU WOULD HAVE TO," IS THAT WHAT
12 YOU DID, SIR?

13 A YES.

14 Q TELL US WHAT YOU DID TO GET IT
15 OPERATIONAL.

16 A WHEN WE GOT THE INSTRUMENT, OF COURSE, WE
17 WOULD UNPACK IT AND MAKE SURE ALL THE PARTS WERE
18 THERE, READ THE MANUALS TO MAKE SURE HOW IT WORKED
19 BECAUSE EACH ONE WAS A LITTLE BIT DIFFERENT.

20 IT WAS LIKE MANUALS YOU GET FOR YOUR
21 AUTOMOBILE.

22 GENERAL MOTORS IS DIFFERENT THAN
23 CHRYSLER.

24 THEN YOU WOULD PUT THE COMPONENTS
25 TOGETHER IN THE FASHION THAT WE WERE INSTRUCTED TO DO
26 SO IN THE MANUALS AND IN SOME INSTANCES, I DON'T
27 REMEMBER IN THIS INSTANCE, WE WOULD ACTUALLY HAVE A
28 SERVICE TECHNICIAN FROM THE MANUFACTURER COME IN AND

1 SET UP THE INSTRUMENT INITIALLY AND VERIFY TO US THAT
2 EVERYTHING WAS OPERATIONAL, THAT ALL THE PARTS ARE
3 THERE AND THAT WE HAD A FUNCTIONAL INSTRUMENT, AS WE
4 HAD PURCHASED, THEY HAD MET THEIR CONTRACT TO US
5 PROVIDING US WITH AN INSTRUMENT THAT WORKS.

6 Q I THINK YOU USED EARLIER THE TERM
7 "CALIBRATION"?

8 A CORRECT.

9 Q AND DO YOU CALIBRATE A GC?

10 A WELL, YOU HAVE TO SHOW THAT IT WORKS.
11 AND YOU HAVE TO DO THAT PERIODICALLY TO
12 MAKE SURE THAT WHENEVER YOU CHANGE THINGS, THINGS OF
13 THAT SORT.

14 SO INITIALLY YOU WOULD GET THE INSTRUMENT
15 SET UP AND MAKE SURE IT MET MANUFACTURERS'
16 SPECIFICATIONS.

17 THEN FOR THIS PARTICULAR ANALYSIS YOU
18 WOULD PUT IN THE TYPES OF THINGS THAT WERE
19 APPROPRIATE TO THAT.

20 THERE ARE DIFFERENT KINDS OF COLUMNS.

21 WE HAD SPECIFIC COLUMNS WE WOULD USE.

22 Q WHEN YOU TALK ABOUT DIFFERENT KINDS OF
23 COLUMNS, AGAIN YOU ARE TALKING ABOUT THAT LITTLE
24 CIRCULAR GLASS?

25 A THAT IS CORRECT.

26 Q INSIDE THE OVEN?

27 A THAT IS CORRECT.

28 THERE ARE DIFFERENT LIQUID PHASES.

1 WE HAD A SPECIFIC LIQUID PHASE THAT
2 WORKED BEST FOR THESE MATERIALS OF WHAT WAS
3 AVAILABLE.

4 AND THEN YOU WOULD ESTABLISH THE
5 OPERATING CONDITIONS WHICH WE HAD ESTABLISHED WITH
6 KNOWN AND THE OTHER INSTRUMENT IN TERMS OF
7 TEMPERATURES, GAS FLOW RATES AND ALL THE THINGS THAT
8 ARE NEEDED TO SETUP FOR THAT INSTRUMENT.

9 AT THAT POINT IN TIME YOU KNEW THE
10 INSTRUMENT WAS WORKING PRETTY WELL AND THEN YOU WOULD
11 TAKE STANDARDS AND RUN IT THROUGH THE INSTRUMENT.

12 NOW, THOSE STANDARDS WERE NOT
13 NECESSARILY, IN FACT, THEY WEREN'T PCB'S.

14 THEY WERE STANDARDS THAT THE MANUFACTURER
15 USED TO QUALIFY THEIR INSTRUMENTATION.

16 SO WE RAN THEIR STANDARDS.

17 IF IT MET THE SPECIFICATIONS, THE
18 MANUFACTURERS' SPECIFICATIONS, THEN WE HAD A PIECE OF
19 EQUIPMENT THAT THEY HAD MET THEIR CONTRACT WITH US.

20 AND IT WORKED.

21 THEN WE TOOK THE PCB STANDARDS, RAN THOSE
22 THROUGH TO SEE THAT WE HAD GOT WHAT WE HAD SCOPED OUT
23 ON THE EARLIER INSTRUMENT, IN TERMS OF, YOU KNOW,
24 TENSION TIMES AND THAT THE CHROMATOGRAPHS LOOKED THE
25 SAME AND THE RESPONSE WAS THE SAME.

26 WE WOULD CALIBRATE THE INSTRUMENT AND
27 THEN WE WOULD PROVE BEYOND A SHADOW OF A DOUBT THAT
28 IT WORKED CORRECTLY AND WE KNEW WHAT WE WERE DOING.

1 Q AGAIN, THOSE LITTLE SQUIGGLES YOU HAVE IN
2 THE GRAPH, ARE WHAT IS REFERRED TO AS A CHROMATOGRAM?

3 A CORRECT.

4 Q YOU MENTIONED EARLIER A MASS SPEC HAD
5 BEEN ORDERED.

6 DID ONE ARRIVE?

7 A I BELIEVE A MASS SPECTROMETER ARRIVED
8 EARLY IN 1968.

9 THERE WERE OTHER PEOPLE -- I WASN'T ONLY
10 PERSON THAT WORKED ON THIS PROJECT.

11 THE KEY ELEMENTS I WORKED ON WERE THE
12 ISOLATION, THE EXTRACTION, YOU KNOW, CLEAN-UP,
13 CONCENTRATION TECHNIQUES, THINGS OF THAT SORT AND
14 THEN THE ELECTRON GAS CHROMATOGRAPHY.

15 CONCURRENTLY THERE WERE ANOTHER TEAM OF
16 FOLKS WORKING ON THE MASS SPECTROMETER AND BRINGING
17 THAT UP.

18 I WAS INTERESTED AND INVOLVED IN IT, BUT
19 I COULDN'T DO BOTH.

20 Q OKAY. AND IS A MASS SPEC SOMETHING YOU
21 CAN PICK OFF OF A SHELF OR IS THAT A SPECIALLY
22 ORDERED ITEM?

23 A NO, SIR.

24 EVEN TODAY THEY ARE RATHER COMMON ITEMS
25 TODAY. YOU CAN'T GET ONE IN LESS THAN EIGHT WEEKS.
26 BUT BACK THEN THEY WERE INDIVIDUALLY
27 BUILT.

28 THE SOURCES AND THE DETECTORS, THINGS OF

1 THAT SORT, WERE ASSEMBLED BY HAND.

2 AND IT WAS A MAJOR UNDERTAKING TO PUT
3 THEM TOGETHER.

4 IN GENERAL, I WOULD SURMISE THAT
5 INSTRUMENT MANUFACTURERS PUT THEM TOGETHER WHEN THEY
6 HAD AN ORDER.

7 YOU WOULDN'T MAINTAIN A \$250,000
8 INSTRUMENT AROUND.

9 SO IT TAKES -- IT WOULD TAKE A WHILE TO
10 GET THAT.

11 AND I BELIEVE IT WOULD TAKE, BACK THEN,
12 IT WAS LIKE SIX MONTHS.

13 AND THEN YOU HAD THE ADDITIONAL PROBLEM
14 THAT THE UNITS THAT WE WERE LOOKING AT WERE ONLY
15 AVAILABLE IN EUROPE.

16 Q WHAT STEPS WERE NECESSARY ONCE IT GOT
17 THERE TO MAKE THAT PIECE OF EQUIPMENT OPERATIONAL?

18 A ONCE THE MASS SPECTROMETER WAS RECEIVED,
19 NOW HERE THERE IS A GAS CHROMATOGRAPH INVOLVED WITH
20 IT.

21 BUT THE MASS SPECTROMETER IS A MUCH MORE
22 COMPLEX PIECE OF EQUIPMENT.

23 Q MAYBE YOU COULD DRAW THE PARALLEL TRACKS,
24 THERE, IF YOU WOULD, A GC AND ECD AS WELL AS THE MASS
25 SPEC FOR US.

26 A WHAT WE TALKED ABOUT EARLIER WAS A GC
27 HOOKED TO AN ELECTRON CAPTURE DETECTOR AND THE OUTPUT
28 THAT WAS WHAT WE CALL A RECORDER.

1 Q I'M SORRY?

2 A A RECORDER. IT INVOLVES SEEING THOSE.
3 THE CHART ROLLS OUT AND IT WRITES ON THE
4 CHART.

5 THERE WAS GC INVOLVED WITH THE MASS SPEC
6 AND THEN THERE WAS A MASS SPEC OVER HERE.

7 NOW, AN ELECTRON CAPTURE DETECTOR IS LIKE
8 \$2,000, SOMETHING LIKE THAT.

9 AND A MASS SPEC CAN BE ANYWHERE FROM 100
10 TO \$200,000.

11 SO THERE IS A LOT OF DIFFERENCE.

12 THIS HAS A LOT MORE PARTS AND IT'S A LOT
13 MORE COMPLEX, THINGS OF THAT SORT.

14 THE GC'S ARE THE SAME, THE INITIAL
15 SEPARATION THING.

16 INTERFACING THESE TWO IS QUITE EASY.
17 THEY BOTH OPERATE UNDER SIMILAR CONDITIONS SO IT'S
18 JUST THE TWO.

19 I WILL TALK A LITTLE BIT LATER ABOUT THE
20 INTERFACE HERE, WHICH IS CONSIDERABLY DIFFERENT.

21 BUT AT ANY RATE YOU WOULD GET THE MASS
22 SPEC IN.

23 IT WOULD COME IN IN BIG CRATES IN
24 DIFFERENT PARTS.

25 THE FIRST THING YOU WOULD TO HAVE DO IS
26 OPEN IT UP.

27 WITH AN INSTRUMENT LIKE THAT WE WOULDN'T
28 HAVE OPENED IT UP UNTIL A SERVICE TECHNICIAN WAS

1 ON-SITE TO VERIFY WITH US WE RECEIVED ALL THE PARTS
2 AND THINGS WERE BROKEN, IF THEY WERE BROKEN, THEY
3 WERE BROKEN IN TRANSIT, NOT BY US NOT KNOWING WHAT WE
4 WERE DOING TRYING TO PUT IT TOGETHER.

5 THE WHOLE THING WOULD BE ASSEMBLED AND
6 THEN THERE WOULD BE A RATHER LENGTHY CHECK-OUT
7 PROCEDURE.

8 I MEAN, YOU WOULD HAVE TO HEAT IT UP,
9 BAKE IT OUT AND EVACUATE IT BECAUSE MASS SPECS
10 OPERATE IN A VACUUM, THAT KIND OF THINGS.

11 SO IT WOULD TAKE A WHILE TO GET ONE SETUP
12 AND OPERATIONAL.

13 Q AND THE VACUUM IS WEIGHTLESSNESS, IF YOU
14 WILL?

15 A RIGHT, NO AIR.

16 AIR -- YOU CAN'T HAVE AIR IN A MASS
17 SPECTROMETER, ANY PRESSURE IN A MASS SPECTROMETER
18 BECAUSE IT DOESN'T WORK IF YOU HAVE EITHER OF THOSE
19 THINGS PRESENT.

20 Q HOW DO YOU MAKE THE MS BOX WORK WITH THE
21 GC, SIR?

22 A OKAY.

23 AS I MENTIONED EARLIER, I MAY NOT HAVE
24 MADE A POINT WITH IT, BUT A GAS CHROMATOGRAPH IS
25 OPERATED AT HIGHER PRESSURE.

26 YOU HAVE ACTUALLY GAS CYLINDERS LIKE THE
27 OXYGEN CYLINDERS YOU SEE AT HOSPITALS AND THINGS OF
28 THAT SORT THAT ARE HOOKED TO IT.

1 THEY PRESSURIZE THE INSTRUMENT AT, SAY,
2 30 TO 50 POUNDS PER SQUARE INCH.

3 A MASS SPECTROMETER OPERATES IN A VACUUM.
4 THERE IS NOTHING THERE. NO PRESSURE.
5 IN FACT, IT'S A MINUS PRESSURE.
6 SO YOU CAN'T JUST HOOK THE TWO UP.

7 SO WHAT YOU HAVE TO DO IS YOU HAVE TO
8 BUILD AN INTERFACE THAT TAKES WHAT YOU BRING OUT OF
9 HERE AND BRINGS IT DOWN TO THE CONDITIONS YOU NEED TO
10 BRING IT TO INTRODUCE IT IN THE MASS SPECTROMETER.

11 Q WOULD AN ANALOGY WOULD BE A TRANSITION
12 BETWEEN THE ENGINE, SOMETHING THAT CONNECTS THE TWO?

13 A CORRECT, CORRECT.

14 AND THE PROBLEM IS THAT YOU HAVE GOT A
15 HUGE AMOUNT OF GAS, UNDER PRESSURE.

16 YOU HAVE GASES LIKE THIS.

17 BUT THEN WHEN IT GETS TO, YOU KNOW,
18 REGULAR ROOM ATMOSPHERIC PRESSURE IT EXPANDS.

19 YOU HAVE A HUGE AMOUNT OF GAS, A VERY
20 SMALL AMOUNT OF PCB'S. YOU WANT TO THROW ALL OF THAT
21 GAS AWAY AND THEN LET THE PCB'S INTO THIS VACUUM,
22 SUCK IT INTO THIS VACUUM.

23 THERE IS A SPECIALIZED INTERFACE CALLED A
24 JET SEPARATOR.

25 AND I WILL TRY TO EXPLAIN IT, BUT I'M NOT
26 SURE HOW IT WORKS. I DO KNOW HOW IT WORKS, THOUGH.
27 THERE ARE OTHER THINGS THAT SPECIALIZE IN THOSE KINDS
28 OF THINGS.

1 IT'S BASICALLY A LARGE TUBE THAT COMES
2 INTO A REAL SMALL TUBE INSIDE OF A THING LIKE THIS
3 WHERE YOU PUMP OFF FAST LIKE THIS.

4 SO THE GAS, THE INTERIOR GAS, I'M NOT
5 VERY GOOD AT DOING IT THAT WAY. I WILL HAVE TO DO IT
6 OVER HERE.

7 I'M SORRY.

8 THE CARRIER GAS COMES IN HERE WITH THE
9 PCB'S, COPIOUS QUANTITIES OF IT.

10 IT IS PUMPED OFF VERY QUICKLY THIS WAY.

11 THIS MOLECULAR OPENING HERE ALLOWS THE
12 PCB'S TO GO INTO THE EVACUATED CHAMBER WITH THE MASS
13 SPECTROMETER.

14 THAT WHOLE THING HAS TO BE IN A HEATED
15 AREA AND HAS TO BE VERY CLEAN.

16 THE FLOWS HAVE TO BE JUST RIGHT AND THOSE
17 KINDS OF THINGS.

18 SO THAT IS THE INTERFACE THAT IS COMMONLY
19 EMPLOYED TODAY WHEN YOU CONNECT A GC TO MASS SPEC,
20 VERY COMMON THING.

21 BACK THEN IT WASN'T COMMON.

22 Q WERE INTERFACES AVAILABLE?

23 A NO, YOU BUILT YOUR OWN.

24 Q AND THAT IS WHAT MONSANTO DID?

25 A YES.

26 WE BUILT OUR OWN.

27 WE HAD A TEAM OF PEOPLE WHO

28 ACTUALLY -- WE HAD A PROCESS, ANALYTICAL CHEMIST, WHO

1 DESIGNED AND BUILT INSTRUMENTS WHO WORKED WITH THE
2 MASS SPEC OPERATOR AND FULLY BUILT THE INTERFACE THAT
3 MIGHT BE SIMILAR TO IT.

4 Q HOW LONG DID IT TAKE THEM, ONCE THE MS
5 ARRIVED, THE MASS SPEC ARRIVED, TO GET THAT
6 OPERATIONAL AS WELL AS ESTABLISHING AN INTERFACE WITH
7 THE GC, SIR?

8 A I DON'T BELIEVE THAT WE REALLY WERE IN A
9 POSITION TO DO ENVIRONMENTAL SAMPLES, YOU KNOW, MAYBE
10 ONE FOR A WEEK UNTIL ALMOST 1969.

11 Q COULD YOU PUT A ONE BY THE GC, ECD UNIT.

12 A OKAY.

13 Q AND THEN A TWO THERE.

14 AND THEN ON THE BOTTOM PUT A THREE.

15 A OKAY.

16 Q NOW, WAY DOWN.

17 A OKAY.

18 Q NOW, YOU MENTIONED EARLIER, YOU CAN
19 EITHER STAY THERE, TAKE A SEAT, WHATEVER YOU LIKE.

20 YOU MENTIONED THERE EARLIER ABOUT TAKING
21 ENVIRONMENTAL SAMPLES AND AN EXTRACTION AND CLEAN-UP.

22 NOW, WHEN WERE YOU ABLE TO -- TELL US
23 WHAT IS INVOLVED IN THAT PROCESS.

24 IS THAT SOMETHING YOU CAN GO TO A BOOK
25 AND FIND OUT HOW TO DO IT?

26 WHAT STEPS WERE NECESSARY FOR YOU TO TAKE
27 TO LEARN HOW TO DO THAT PROCESS?

28 A NO, NO.

1 THESE WERE NOT STANDARDIZED ANALYTICAL
2 METHODOLOGIES.

3 THESE WERE ANALYTICAL METHODOLOGIES YOU
4 DEVELOPED AND THAT ULTIMATELY, LATE, MANY YEARS LATER
5 BECAME STANDARDIZED AND CODIFIED.

6 MOST OF THE WORK INITIALLY WAS DONE WITH
7 KNOWN.

8 BY THAT I MEAN, TERM I KNEW WHAT IT WAS
9 AND I PUT IT IN ONE OF THE WHOLE PROCESS AND TOOK IT
10 OUT THE OTHER END OF THE PROCESS AND I KNEW WHAT I
11 SHOULD GET BACK.

12 IF I GOT BACK WHAT I PUT IN, I WAS VERY
13 HAPPY. BECAUSE THE DIFFERENT PROCEDURES THAT I HAD
14 SUGGESTED OR CHOSEN TO AFFECT THE SEPARATION, THINGS
15 OF THAT SORT, THE PCB'S WERE ABLE TO GET THROUGH
16 THAT.

17 BUT IF I DIDN'T SEE THEM ON THE OTHER
18 END, THEN I HAD TO GO BACK TO THE VARIOUS PROCEDURES,
19 THE EXTRACTION, THE MACRO SEPARATION, THE CLEAN UP,
20 THE MICRO SEPARATION, THE CONCENTRATION STEPS.

21 I WOULD HAVE TO GO BACK IN AND DETERMINE
22 WHICH OF THOSE STEPS WERE NOT WORKING CORRECTLY.

23 AND IT'S WHAT WE CALL A RE-ENTRY PROCESS,
24 IN OTHER WORDS YOU KEEP DOING IT OVER AND OVER AGAIN
25 UNTIL YOU GET RID OF ALL THE PROBLEMS AND BUGS.

26 YOU HAVE A STANDARD OPERATING PROCEDURE
27 OR AN ANALYTICAL METHOD THAT WORKS WITH KNOWN.

28 Q SO THAT WAS A TRIAL AND ERROR PROCEDURE

1 FOR YOU?

2 A CORRECT.

3 AT THAT POINT IN TIME YOU ARE ABOUT TO
4 BEGIN WORKING WITH, QUOTES, "REAL SAMPLES."

5 Q SO NUMBER 3, THEN, WOULD BE YOUR SAMPLE
6 ANALYSIS?

7 A RIGHT.

8 Q LEARNING THOSE TECHNIQUES?

9 A THERE IS ONE LEVEL BETWEEN THAT AND
10 REALLY DOING REAL SAMPLES.

11 THAT IS WHERE YOU TAKE SAMPLES OF
12 MATRIXES THAT YOU KNOW YOU DON'T HAVE WHAT YOU ARE
13 LOOKING FOR IN IT AND YOU PUT IT IN THERE.

14 Q OKAY.

15 A THEN YOU MAKE SURE YOU CAN REALLY GET IT
16 OUT OF SOIL AND OUT OF WATER AND THOSE KINDS OF
17 THINGS AND GET IT THROUGH YOUR THING.

18 ONCE YOU HAVE ESTABLISHED THAT, THEN YOU
19 ARE READY TO GO GET SAMPLES, REAL-LIFE SAMPLES.

20 AND ACTUALLY ANALYZE THE SAMPLES AND SEE
21 WHAT IS THERE.

22 Q SO THREE WOULD BE -- WOULD YOU MAKE IT
23 TWO STEPS, THEN, THE KNOWN SAMPLING AND THEN UNKNOWN
24 SAMPLES?

25 A CORRECT.

26 Q AS ONE OF THE INGREDIENTS YOU NEEDED?

27 A THERE WOULD BE STANDARDS, KNOWN SAMPLES
28 YOU PREPARED, SPIKED WITH KNOWN MATERIALS AND THEN

1 THE REAL THING.

2 Q WOULD YOU PUT THAT ON THE BOARD?

3 A YES, SIR.

4 THE COURT: WE ARE GOING TO MARK THIS PAPER,
5 MR. PREUSS?

6 MR. PREUSS: WE CAN, YOUR HONOR.

7 THE WITNESS: MAY I START WITH A NEW OR DO YOU
8 WANT THIS ON THIS?

9 Q BY MR. PREUSS: NO, YOU CAN DO IT ON THE
10 OLD ONE.

11 THE COURT: THE NEXT AVAILABLE NUMBER IS 812.

12 MR. PREUSS: THANK YOU.

13 THE COURT: DO YOU WANT TO MARK ALL THE PAGES
14 OR SIMPLY ONE?

15 MR. PREUSS: WHY DON'T WE MARK THEM ALL.

16 THE COURT: COLLECTIVELY AS 812.

17 MR. PREUSS: THANK YOU.

18 THE WITNESS: STANDARDS.

19 Q BY MR. PREUSS: COULD YOU JUST WRITE ON
20 THERE 812 ON ONE OF THE CORNERS THERE SO WE CAN
21 REMEMBER THAT.

22 A 812 OR 8-12?

23 Q 812.

24 A ALL RIGHT.

25 Q I THINK YOU NEED AN N ON NUMBER 2,
26 K-W-O-N.

27 YOU WORK WITH STANDARDS, YOU WORK WITH
28 KNOWN AND THEN YOU ARE READY TO WORK WITH UNKNOWN.

1 Q HOW LONG CAN THAT PROCESS TAKE YOU WITH
2 RESPECT TO THE NEW GAS CHROMATOGRAPH AND THE NEW ECD,
3 TO GET IT TO THE POINT WHERE YOU WERE READY TO START
4 LOOKING AT THE UNKNOWNNS?

5 A OKAY. THE UNKNOWNNS, SOME ARE EASIER THAN
6 OTHERS.

7 AIR IS A VERY EASY UNKNOWN TO LOOK AT
8 BECAUSE THERE ARE NOT MANY INTERFERENCES AND OTHER
9 THINGS IN THERE AT MACRO LEVELS.

10 Q "INTERFERENCES," AGAIN?

11 A OTHER KINDS OF THINGS THAT YOU NEED TO
12 SEPARATE IT FROM.

13 I DON'T -- THERE ARE DIFFERENT KINDS OF
14 INTERFERENCES.

15 WATER, FOR EXAMPLE, HAS A LOT OF THINGS
16 DISSOLVED IN IT, THAT SORT ARE OF THINGS. SO THAT IS
17 THE NEXT KIND OF SAMPLE THAT IS MORE DIFFICULT TO
18 HANDLE.

19 THEN SOILS ARE MORE DIFFICULT BECAUSE
20 THERE ARE MORE THINGS IN THERE.

21 AND THEN SLUDGES CAN BECOME VERY MUCH
22 MORE DIFFICULT AND THAT KIND OF THING.

23 SO YOU WOULD, AT SOME POINT IN HERE, YOU
24 WOULD PROBABLY START WORKING WITH WATER, OKAY?

25 BY THIS TIME WE ARE PREPARED TO WORK WITH
26 WATER SO WE MIGHT GET SOME REAL WATERS AND MIGHT BE
27 ALMOST READY TO WORK WITH SOILS.

28 I THOUGHT ABOUT THIS FOR A LONG PERIOD OF

1 TIME.

2 AND WE REALLY WERE IN A POSITION TO FEEL
3 VERY COMFORTABLE WITH JUST KNOWING WHAT WE WERE DOING
4 WITH KIND OF KNOWN, KNOWN STARTING AROUND '69, LATE
5 '68, '69.

6 Q USING DIFFERENT TYPES OF SAMPLES, YOU
7 MENTIONED WATER, HAIR, SOIL AND YOU SAID SLUDGES, DID
8 YOU HAVE TO DEVELOP METHODOLOGIES FOR EXTRACTION ON
9 EACH ONE OF THOSE?

10 A CORRECT.

11 Q WHEN WOULD YOU PULL THE PCB'S OUT OF
12 WATER OR WHEN YOU PULLED THEM OUT OF THERE, WOULD YOU
13 GET OTHER THINGS OUT OF THOSE?

14 A NO, A LOT MORE ORGANIC MOLECULES IN WATER
15 AND ORGANIC MOLECULES IN SOIL THAN THERE ARE IN AIR.
16 THEY ARE JUST ABLE TO DISSOLVE MORE IN
17 IT.

18 Q COULD YOU TURN THE PAGE BACK TO STEPS ONE
19 AND TWO, IF YOU CAN.

20 A OKAY.

21 Q CAN YOU TELL US HOW ONE AND TWO WORK
22 TOGETHER, IF THEY DO, WITH RESPECT TO TRYING TO
23 ANALYZE A SUBSTANCE AND MAYBE START WITH A KNOWN ONE
24 AND THEN MOVE ON TO AN UNKNOWN ONE.

25 A OKAY.

26 WELL, THERE IS A SUBTLE DIFFERENCE
27 BETWEEN THE TWO, BETWEEN THE TWO TECHNIQUES, BETWEEN
28 ELECTRON CAPTURE AND BETWEEN A MASS SPEC.

1 THE ELECTRON CAPTURE CAN TELL YOU IF IT'S
2 THERE. BUT IT CAN'T TELL YOU FOR SURE.

3 AND IT'S DONE -- IT COSTS LESS TO DO AND
4 IT TAKES LESS TIME, THINGS OF THAT SORT, BUT IT
5 DOESN'T GIVE YOU -- THE QUALITY OF THE INFORMATION
6 ISN'T AS GOOD.

7 NOW, THE MASS SPEC COSTS A LOT. IT TAKES
8 A LONG TIME TO DO, BUT, AS I SAID, IT ABSOLUTELY
9 TELLS YOU IF IT'S THERE.

10 SO THE WAY THESE WERE USED IS, YOU WOULD
11 RUN A -- IF YOU ARE DEALING WITH KNOWN, YOU RUN A
12 KNOWN THROUGH AN ELECTRON CAPTURE GAS CHROMATOGRAPH
13 AND YOU SAY, I THINK IT'S THERE. I'M PRETTY SURE.

14 YOU TAKE ANOTHER SAMPLE OF THE KNOWN AND
15 YOU RUN IT THROUGH MASS SPEC AND THE MASS SPEC WOULD
16 SAY, YEAH, YOU'RE RIGHT. IT'S THERE.

17 Q SO YOU WOULD TAKE AN EXTRACT AND FROM
18 THAT EXTRACT YOU PROCESS IT SO IT'S READY TO GO INTO
19 THE INSTRUMENT SO YOU WOULD DIVIDE IT UP AND PART OF
20 IT WENT IN THE GC ECD AND THE OTHER WENT IN THE GC
21 MS?

22 A YEAH, IF YOU DIDN'T SEE ANYTHING, YOU
23 WOULD SAY THERE IS NOTHING THERE.

24 IF YOU SAW SOMETHING, YOU WOULD SAY THERE
25 IS PROBABLY SOMETHING THERE.

26 DEPENDING UPON HOW CLOSE IT LOOKED TO
27 YOUR STANDARD, YOU COULD SAY WHETHER IT'S A HIGH
28 PROBABILITY OR LOW PROBABILITY.

1 BUT YOU WOULD HAVE TO TAKE IT OVER HERE
2 TO CONFIRM IT TO ABSOLUTELY IDENTIFY THE FACT IT WAS
3 THERE.

4 Q WHEN YOU ARE DEALING WITH UNKNOWN
5 SUBSTANCES, DOES THE NUMBER TWO STEP BECOME EVEN MORE
6 IMPORTANT?

7 A YES.

8 Q AND WHY IS THAT?

9 A WELL, FOR EXAMPLE, SOREN JENSEN AND
10 GUNNAR WIDMARK WERE LOOKING AT PCB'S.

11 WHAT THEY WERE SEEING WERE ONLY THE
12 OCTACHLORAL AND THE HIGHER CHLORINATED ISOMERS.

13 Q THAT IS THE EIGHT?

14 A YES.

15 THEY WEREN'T SEEING AROCLORS. THEY WERE
16 SEEING PCB'S.

17 THEY WEREN'T SEEING PCB'S THAT LOOKED
18 LIKE AROCLORS.

19 I MEAN, THE PATTERNS WEREN'T THE SAME OR
20 ANYTHING OF THAT SORT.

21 SO IN ORDER -- THEY DIDN'T HAVE
22 STANDARDS.

23 AS I SAID, MASS SPEC IS AN ABSOLUTE
24 IDENTIFICATION TECHNIQUE.

25 SO THEY WERE ABLE TO TAKE THE MASS SPEC
26 AND IDENTIFY THE FACT THAT THEY HAD POLYCHLORINATED
27 BIPHENYLS, OCTACHLORO, PRESENT IN THAT SAMPLE.

28 THAT IS THE VALUE OF THE MASS SPEC.

1 Q OKAY. NOW, IN USING THE MASS SPEC HOW DO
2 YOU FIGURE OUT WHERE ALL THE PEAKS ARE OR SHOULD BE
3 OR HOW WERE YOU DOING THAT INITIALLY, I SHOULD SAY.

4 A OKAY.

5 THE KIND OF CHROMATOGRAPHY YOU EMPLOYED,
6 THE GAS CHROMATOGRAPHY, THE ORIGINAL SEPARATION
7 TECHNIQUE THEY ARE PRETTY EQUIVALENT, THERE ARE SOME
8 DIFFERENCES BUT THEY ARE PRETTY EQUIVALENT.

9 WE KNOW FROM THIS DETECTOR WHERE THE
10 PEAKS COME OUT AND WHERE THE PEAKS GO THROUGH THE
11 INTERFACE AND INTO THE MASS SPEC.

12 AND THE MASS SPECTROMETER MONITORS
13 SOMETHING THAT IS CALLED TOTAL ION CURRENT.

14 AND IT GIVES YOU THE KIND OF PRINTOUT
15 THAT AN ELECTRON CAPTURE DETECTOR PRINTOUT GIVES YOU.

16 IT ALSO DOES ANOTHER THING IN THE SENSE
17 THAT IT LOOKS AT WHAT YOU ARE SEEING AS IT COMES OUT
18 AND IT LOOKS AT ALL THE DIFFERENT PIECES.

19 I CAN TRY TO EXPLAIN WHAT IT DOES, IF YOU
20 WOULD LIKE ME TO DO SO.

21 Q WHY DON'T YOU DO THAT AS BASICALLY AS YOU
22 CAN.

23 A OKAY.

24 WE HAVE GOT THE MASS SPEC AND WE HAVE ALL
25 THE TOTAL ION CURRENT, MONITOR, WHATEVER YOU WANT TO
26 DO.

27 THIS IS TIME.

28 Q DOCTOR, TRY TO KEEP YOUR VOICE UP AND

1 STATE SLOWLY.

2 A WHICH IS EQUIVALENT TO TIME.

3 SO YOU END UP WITH THIS SAME TYPE OF
4 CHROMATOGRAM WE SAW EARLIER WHERE THESE COULD OR
5 COULD NOT BE PCB'S BUT THEY ARE THINGS THAT THE
6 INSTRUMENT IS RESPONDING TO, THAT YOU ISOLATED WHEN
7 YOU WENT THROUGH ALL THE SEPARATION TECHNIQUES.

8 AT THE SAME TIME WHAT HAPPENS IS THAT
9 THESE MOLECULES, BIPHENYL OR WHATEVER, DDT, WHATEVER,
10 GO INTO THE MASS SPEC AND THEY ARE BOMBARDED WITH AN
11 ELECTRON BEAM.

12 Q SO THEY GO THROUGH THE INTERFACE?

13 A CORRECT.

14 Q AND THEN THEY GET INTO THE MASS SPEC?

15 A CORRECT.

16 THE OBJECTIVE OF THAT ELECTRON BEAM IS TO
17 CHARGE THE MOLECULES, OKAY?

18 YOU HAVE GOT THIS PEAK.

19 YOU SAY THIS WAS -- WE WILL JUST USE THAT
20 TO SYMBOLICALLY REPRESENT ONE OF THE THINGS IN THAT
21 PEAK.

22 THIS GOES INTO THE MASS SPECTROMETER AND
23 THERE ARE ELECTRIC NODES HERE THAT IONIZE THIS THING
24 AND IT BECOMES CHARGED, SAY IT HAS A POSITIVE CHARGE,
25 OKAY?

26 AND THEN IT GOES THROUGH A MAGNETIC
27 SEPARATOR WHICH IS PART OF THE MASS SPECTROMETER AND
28 THEN THERE IS A DETECTOR OVER HERE.

1 IF IT'S UNBROKEN, NOT FRAGMENTED, BROKEN
2 INTO PARTS, IT GOES DIRECTLY THROUGH.

3 DEPENDING ON WHAT IT'S MASS IS IT WILL
4 CURVE DOWN AND HIT THIS PLATE.

5 THE POSITION IT HITS --

6 Q THE MASS BEING ITS WEIGHT?

7 A LIKE I SAID, BIPHENYL IS 154.

8 IF THIS WERE BIPHENYL AND IT CAME DOWN
9 AND HIT THE PLATE, YOU WOULD KNOW THAT IT WAS 154.

10 SO THAT WOULD PROBABLY TELL YOU, GIVE YOU
11 A CLUE YOU MIGHT BE DEALING WITH BIPHENYL.

12 OTHER THINGS THAT HAPPEN IN THIS SOURCE,
13 FOR EXAMPLE, IS THAT THIS COULD BE BROKEN INTO TWO
14 PIECES.

15 IN OTHER WORDS, THOSE TWO RINGS COULD BE
16 BROKEN APART AND NOW WE HAVE TWO OTHER THINGS IN HERE
17 FRAGMENTED BY THE ELECTRON BEAM AND THESE ALSO HAVE A
18 CHARGE.

19 THOSE WOULD BE LIGHTER.

20 SO I'M GOING TO PUT "LIGHTER" DOWN HERE
21 BECAUSE IT'S EASIER.

22 SO THEY WOULD FALL LIKE THIS, OKAY?

23 AND THEN ALSO YOU COULD TAKE THAT AND IT
24 MIGHT BREAK INTO FOURS.

25 AND THEN THOSE WOULD BE EVEN LIGHTER,
26 EACH INDIVIDUAL PIECE WOULD BE LIGHTER SO IT COULD
27 WOULD GO LIKE THAT.

28 IT'S CALLED A MASS SPECTROMETER.

1 IN ADDITION TO THAT YOU WOULD HAVE ONE OF
2 THESE, TWO OF THESE AND FOUR OF THOSE.

3 SO WHEN YOU LOOKED AT THE RESPONSE HERE,
4 YOU WOULD EXPECT TO SEE THEM IN A RATIO TO ONE TO TWO
5 TO FOUR, OKAY?

6 SO YOU END UP WITH, IN ADDITION TO THIS
7 PEAK COMING OUT HERE FOR THAT PEAK, YOU END UP WITH A
8 NUMBER VERSUS ATOMIC MASS UNITS AND YOU WOULD END UP
9 WITH A -- THIS IS THE LOW TO HIGH, ZERO TO 800, WE
10 WILL CALL IT.

11 YOU WOULD END UP, SAY THIS IS 154, HALF
12 OF 154 IS 72.

13 IS THAT RIGHT?

14 WELL, 77, SORRY.

15 AND HALF OF 77, LET'S SAY, THAT WOULD BE
16 37, SOMETHING LIKE THAT.

17 BUT AT ANY RATE, AT 37, 77 AND 154 WOULD
18 YOU END UP WITH PEAKS OR FRACTION AMOUNTS THAT LOOKED
19 LIKE THIS AND THE RATIO OF FOUR TO TWO TO ONE.

20 AND THAT WOULD ABSOLUTELY IDENTIFY THAT
21 BECAUSE YOU COULD PUT THAT BACK TOGETHER AND FORM
22 THAT BIPHENYL MOLECULE AND THAT IS THE WAY YOU
23 ABSOLUTELY IDENTIFY THAT THAT IS PRESENT, OKAY?

24 Q OKAY.

25 A THAT IS WHY A MASS SPECTROMETER IS NOT
26 UNIQUE AMONG ALL THE DETECTION SYSTEMS.

27 Q LET'S TAKE A TIME FRAME OF 1968,
28 DR. TUCKER.

1 HOW LONG WOULD IT TAKE YOU TO ANALYZE A
2 SAMPLE, ONCE YOU HAD YOUR GC ECD AND YOUR MASS SPEC
3 IN OPERATION?

4 A BY THE TIME THE INITIAL SAMPLES, BY THE
5 TIME YOU TAKE THEM THROUGH ALL THE PROCEDURES, THE
6 EXTRACTION, THE MACRO SEPARATION, MICRO SEPARATION,
7 THE CLEANUPS, THE CONCENTRATION, THE GAS
8 CHROMATOGRAPHY ELECTRON CAPTURE WORK AND AT THAT
9 POINT IN TIME YOU SAW SOMETHING, THEN YOU WOULD TAKE
10 THE EXTRACT OVER TO THE MASS SPECTROMETER AND YOU
11 WOULD RUN IT THROUGH THE MASS SPECTROMETER.

12 IT COULD BE TWO WEEKS BEFORE YOU GOT THE
13 RESULTS ALL OUT.

14 Q THAT IS FOR A SINGLE SAMPLE?

15 A YES, SIR.

16 Q AND DID YOU HAVE A COMPUTER TO ASSIST YOU
17 AT ALL IN THIS?

18 A NO.

19 EARLY ON -- NOWADAYS COMPUTERS HAVE MADE
20 OUR LIFE VERY EASY.

21 I THINK IT HAS MADE IT VERY COMPLEX.

22 AT ANY RATE AT THAT POINT IN TIME WE
23 DIDN'T HAVE COMPUTERS TO HANDLE DATA.

24 SO THE WAY THE INFORMATION ON THE MASS
25 SPECTROMETER WAS OBTAINED WAS BY USING WHAT IS CALLED
26 OSCILLOGRAPHICS RECORDER IT'S LIKE A STRIP CHART
27 RECORDER, TO SPIN A LIGHT. ALL OF THESE THINGS
28 HAPPEN SO FAST THE CHART SPEED TO RECORD IS 100 FEET

1 PER MINUTE.

2 IT MEANT IF YOU LET IT RUN FOR A MINUTE
3 100 FEET OF THE PAPER WOULD COME OUT.

4 THE PAPER WAS PHOTOGRAPHIC PAPER,
5 SENSITIVE TO LIGHT.

6 A REGULAR MECHANICAL PEN COULDN'T GO FAST
7 ENOUGH TO RECORD THE EVENTS SO WE USED A LIGHT PEN.

8 SO WHEN ONE OF THESE, THE PEAK WOULD BE
9 SHOWN WE WOULD PASS IT BUT ONLY TO OBTAIN THE MASS
10 SPECTRUM, SCAN FROM ZERO TO 100 AMU'S OVER AND OVER
11 AGAIN.

12 THAT WOULD BE RECORDED ON THE
13 OSCILLOGRAPHIC PAPERS.

14 WE WOULD ROLL THESE UP AND THEN SINCE
15 THEY WERE LONG, AT NIGHT WHEN PEOPLE HAD GONE HOME,
16 WE WOULD HAVE A BIG HALLWAY THERE.

17 WE WOULD ROLL THEM OUT ON THE HALLWAY AND
18 TAKE A METER STICK AND MEASURE THE THINGS AND WE
19 COULD RELATE THE MEASUREMENT TO THE WEIGHT, TO ATOMIC
20 MASS UNIT.

21 THAT IS THE WAY WE DISCOVERED WHETHER OR
22 NOT WE ACTUALLY HAD POLYCHLORINATED BIPHENYLS OR
23 WHATEVER THERE.

24 Q SO YOU HAD TO ROLL THE SHEET OUT?

25 A CORRECT.

26 Q AND THEN MEASURE IT.

27 DID YOU HAVE TO BE PRECISE IN YOUR
28 MEASUREMENTS?

1 A YES.

2 Q WHY DID YOU HAVE TO BE PRECISE?

3 A WELL, ZERO TO 800 OVER THIS LONG THING, I
4 MEAN IF YOU MAKE A SMALL ERROR OVER HERE AND YOU
5 REPEAT IT, IT TRANSLATES INTO A BIG ERROR.

6 IT IS LIKE IF I WANT TO GO FROM THERE TO
7 THERE AND I'M OFF A LITTLE, THE FURTHER THAT IS AWAY
8 THE MORE I WILL MISS IT.

9 YOU HAD TO BE VERY CAREFUL THAT YOU ARE
10 CALIBRATED PROPERLY AND YOUR STANDARDS WERE IN PLACE.

11 Q IN THE INITIAL SAMPLES, THAT HAD TO BE
12 DONE MANUALLY?

13 A YES.

14 Q AT SOME POINT DID MONSANTO ACQUIRE A
15 COMPUTER TO ASSIST IN THIS PROCESS?

16 A YES, WE DID.

17 Q WHEN WAS THAT?

18 A I THINK IT WAS IN '69 THAT THE COMPUTER
19 WAS OBTAINED OR, AT LEAST, FOR SURE IT WAS UP IN '69.

20 THAT HELPED CONSIDERABLY IN TERMS OF THE
21 DATA HANDLING.

22 Q AND THE ABILITY TO COMPLETE A SAMPLE WITH
23 MORE QUICKNESS?

24 A CORRECT. AND WITH MORE -- IT MADE IT
25 MORE REPETITIVE, MORE REPRODUCEABLE. BECAUSE YOU
26 TOOK MORE OF THE HUMAN ELEMENT OUT OF IT.

27 Q OKAY. NOW, YOU INDICATED THAT ABOUT
28 AROUND 1969 THERE WAS A -- AT THE START OF 1969 YOU

1 HAD YOUR UNITS IN PLACE AND YOU HAD METHODOLOGIES
2 DOWN PRETTY WELL AND YOU WERE READY TO START TAKING A
3 LOOK AT A SUBSTANCE THAT MAY BE FOUND IN THE
4 ENVIRONMENT, IF YOU WILL; IS THAT RIGHT?

5 A CORRECT.

6 Q AND WHAT -- TELL US WHAT DID YOU IN TERMS
7 OF ANALYTIC WORK IN 1969 TO MOVE MONSANTO'S KNOWLEDGE
8 AHEAD WITH RESPECT TO THE PRESENCE OF PCB'S IN THE
9 ENVIRONMENT?

10 A WELL, INITIALLY WE DECIDED THAT WE WOULD
11 GO TO PLACES THAT HAD THE HIGHEST PROBABILITY OF
12 HAVING THOSE CONSTITUENTS THERE.

13 AND, OF COURSE, THAT WOULD BE OUTSIDE OF
14 THE UNITS WHERE THEY WERE MANUFACTURED AND/OR USED.

15 AND SO THAT IS BASICALLY WHAT WE DID.

16 WE WOULD GO TO THE SOURCE BECAUSE IN OUR
17 OPINION IF WE WERE GOING TO FIND AROCLORS OR PCB'S,
18 THAT WOULD BE WHERE WE WOULD FIND THEM FIRST.

19 THEN HAVING DONE THAT, THEN WE WOULD MOVE
20 ON.

21 BECAUSE IF YOU DIDN'T FIND THEM AT THE
22 SOURCE, THEN YOU HAD TO HAVE SOME OTHER EXPLANATION
23 FOR WHY THEY WERE BEING FOUND OUT IN THE OCEAN, SEA
24 HAWKS, THINGS OF THAT SORT.

25 Q AND DID YOU SEEK WATER SAMPLES AND TEST
26 THOSE?

27 A CORRECT.

28 THE FIRST MATRIX WE STARTED DEALING WITH

1 WERE WATERS AND I THINK SUBSEQUENT TO THAT WERE
2 SEDIMENTS ASSOCIATED WITH THOSE WATERS.

3 Q DID YOU EXPAND OUT INTO OTHER SUBSTANCES
4 IN 1969?

5 A CORRECT.

6 I BELIEVE IT WAS IN 1969 THAT WE HAD A
7 FIRM PRODUCE TISSUE SAMPLES OF LABORATORY ANIMALS
8 THAT WERE EXPOSED TO THESE MATERIALS AND THAT WE
9 BEGAN LOOKING AT THOSE KINDS OF THINGS, TOO.

10 Q AND WHAT WERE YOU LOOKING FOR FROM TISSUE
11 SAMPLES?

12 A IN THE TISSUE STUDIES WE WERE LOOKING FOR
13 WHEN THE ANIMAL WAS INTENTIONALLY EXPOSED TO THESE
14 MATERIALS WE WERE LOOKING TO WHERE IT WENT, HOW MUCH
15 THE ANIMAL RETAINED.

16 WE WERE TRYING TO DO BASICALLY A MATERIAL
17 BALANCE AS TO WHETHER IT WENT TO THE FAT OR THE
18 MUSCLE, WHETHER IT WAS EXCRETED AND ALSO VERY
19 IMPORTANTLY WE WERE TRYING TO ESTABLISH WHETHER OR
20 NOT THE AROCLOR PATTERN WAS ALTERED SUCH THAT WE
21 COULD EXPLAIN WHERE THESE ALTERED PATTERNS THAT OTHER
22 PEOPLE WERE SEEING WERE COMING FROM.

23 Q OKAY. AND WAS THAT INFORMATION AVAILABLE
24 OUT IN THE WORLD?

25 A NO.

26 Q IS THAT NEW GROUND?

27 A YES.

28 THAT HAD NOT BEEN DONE BEFORE.

1 Q OKAY. NOW, YOU TALKED ABOUT THAT JENSEN
2 AND WIDMARK WERE PESTICIDE RESEARCHERS?

3 A CORRECT.

4 Q AND IN DDT WAS A PESTICIDE THEY WERE
5 TAKING A LOOK AT?

6 A YES.

7 Q AND CAN YOU DESCRIBE FOR US THE
8 DIFFERENCE BETWEEN LOOKING FOR DDT, FOR EXAMPLE, AND
9 LOOKING FOR PCB'S?

10 A OKAY.

11 WELL, FIRST OF ALL, THEY ARE BOTH
12 CHLORINATED HYDROCARBONS.

13 AND THE DDT IS A SINGLE CONSTITUENT.
14 IT'S ONE THING.

15 THE PCB'S ARE 209 CONSTITUENTS.

16 IN ADDITION TO THAT, DDT, DID THEY HAVE A
17 COUPLE OF OTHER PEAKS ASSOCIATED WITH IT? THEY WERE
18 METABULITES AND IMPURITIES, DDE THEY CALLED IT.

19 SO AT THE MAXIMUM YOU MIGHT BE LOOKING
20 FOR ONE PEAK PLUS TWO TO FOUR OTHERS IN THE
21 CHROMATOGRAM VERSUS THE 209 PEAKS YOU WOULD BE
22 LOOKING FOR PCB'S.

23 Q AND WHEN YOU SAY "209 PEAKS," ARE YOU
24 SAYING THERE ARE 209 DIFFERENT LOOKS OF PCB'S THAT
25 YOU WOULD SEE ON A CHROMATOGRAM POSSIBLE?

26 A I DON'T THINK WE WERE EVER REALLY ABLE TO
27 ACHIEVE 100 PERCENT RESOLUTION, BUT CERTAINLY WE GOT
28 TO THE POINT WHERE YOU COULD SEE LITERALLY HUNDREDS

1 OF PEAKS, 50 TO 100 PEAKS, I THINK.

2 Q I WANT TO SHOW YOU A PORTION OF SOME GAS
3 CHROMATOGRAMS FROM EXHIBIT 241.

4 NOW, THOSE ARE CHROMATOGRAMS OF WHAT WE
5 WOULD CALL KNOWN SAMPLES; IS THAT CORRECT?

6 A RIGHT.

7 THESE ARE AROCLOR PRODUCT SAMPLES.

8 Q ALL RIGHT.

9 A AND AS I TALKED ABOUT EARLIER, THE FIRST
10 ONE WOULD BE AROCLOR 1221 EQUIVALENT TO A MONO.

11 THEN AROCLOR 1242, TRI.

12 AROCLOR 1254 WOULD BE A PENTA OR FIVE.

13 AND THEN AROCLOR 1260 WHICH WOULD BE A
14 SIX.

15 AND THOSE ARE ELECTRON CAPTURE
16 CHROMATOGRAMS.

17 ON THE LEFT THE PEAKS ARE THE RESPONSE,
18 THE AMOUNT THAT IS THERE.

19 AND ON THE RIGHT ARE THE INDIVIDUAL
20 CONSTITUENTS THAT ARE THERE.

21 AND THE AROCLOR 1221 IS LOWER BOILING,
22 MORE VOLATILE THAN THE 1260.

23 SO THAT IS WHY IT COMES OUT EARLIER AND
24 THE NEXT ONE COMES OUT.

25 IT'S RELATED TO THE WEIGHT.

26 Q SO IF YOU HAD A STANDARD, LET'S SAY YOU
27 HAD A STANDARD AND IT LOOKED LIKE THIS AND YOU RAN A
28 KNOWN SAMPLE IN IT, YOU WOULD EXPECT IT TO COME OUT

1 JUST THE SAME WAY, RIGHT?

2 A THAT IS CORRECT.

3 Q WHAT ABOUT IF YOU WERE TAKING A SAMPLE
4 FROM THE OUTSIDE THAT HAD BEEN OUT IN THE WATER OR
5 BEEN OUT IN THE SOIL FOR A WHILE, WOULD IT LOOK LIKE
6 THAT?

7 A NO.

8 THERE WERE -- WE LATER FOUND THERE WERE A
9 LOT OF THINGS THAT HAPPENED TO PCB'S IN WEATHERED
10 ENVIRONMENTAL SAMPLES THAT CHANGED WHAT THAT
11 CHROMATOGRAM LOOKED LIKE.

12 Q AND HOW DID THAT IMPACT UPON YOUR ABILITY
13 TO ANALYZE THE SUBSTANCE?

14 A WELL, WHAT WOULD HAPPEN IS THAT
15 BASICALLY -- HALF OF ONE OF THOSE CHROMATOGRAMS MIGHT
16 DISAPPEAR AND THEN PART OF WHAT WAS LEFT WOULD
17 DISAPPEAR, TOO.

18 IT WOULD CHANGE THE THING SO IT DIDN'T
19 LOOK LIKE ANYTHING LIKE THE ORIGINAL CHROMATOGRAM.

20 YOU MIGHT HAVE PEAKS WITH THE SAME
21 RETENTION TIMES.

22 SO WHAT YOU WOULD TO HAVE TO SAY IS THERE
23 MIGHT BE PCB'S THERE AND THERE MIGHT BE THIS MUCH.

24 NOW, THE MORE ALTERATIONS YOU HAD, THE
25 MORE QUALITATIVE YOUR MEASURING WAS, THE LESS ON THE
26 MARK YOU MIGHT BE.

27 Q IN THOSE SITUATIONS DID THAT MAKE THE
28 MASS SPECTROMETER A MORE IMPORTANT TOOL TO HAVE IN

1 THAT?

2 A IN THAT SITUATION IF YOU WANTED TO KNOW
3 IF YOU WERE DEALING A PCB AND NOT GUESS, YOU WOULD
4 HAVE TO HAVE A MASS SPECTROMETER TO IDENTIFY IT.

5 Q OKAY. NOW, SOME SAMPLES ARE, I TAKE IT,
6 METABOLIZED OR DEGRADED BIOLOGICALLY IN THE
7 ENVIRONMENT; IS THAT WHAT YOU FOUND?

8 A WE FOUND THAT PCB'S WERE BIODEGRADABLE
9 AND THAT THEY DID UNDERGO WHAT WE CALLED THE
10 WEATHERING PROCESS.

11 WE USED THE TERM "WEATHERING" BECAUSE
12 THERE ARE MORE THINGS THAN JUST BIODEGRADATION THAT
13 CAN OCCUR, LIGHT CAN CAUSE THINGS, U.V. LIGHT CAN
14 CAUSE THINGS TO FALL APART, AND THERE ARE A LOT OF
15 OTHER PHYSICAL CHEMICAL THINGS THAT CAN CHANGE IN
16 MOLECULE STRUCTURES SO WE CALLED IT WEATHERED.

17 Q THE PROCESS YOU HAVE DESCRIBED AS FAR AS
18 THE PC WITH THE ELECTRON DETECTOR THE MASS SPEC ALSO
19 TIED INTO THE GC WITH AN INTERFACE, WAS THAT THE SAME
20 THING THAT JENSEN AND WIDMARK WERE DOING OR HOW WERE
21 YOUR EFFORTS DIFFERENT IN ANY WAY?

22 A WELL, THEY WERE THE SAME ANALYTICAL
23 TECHNIQUES.

24 BUT JENSEN AND WIDMARK WERE SIMPLY TRYING
25 TO EXPLAIN WHAT THEY COULDN'T EXPLAIN UP TO THAT
26 POINT IN TIME.

27 THEY WOULD LOOK AT AN ENVIRONMENTAL
28 SAMPLES FOR, SAY, DDT, SOMETHING OF THAT SORT, AND

1 THEY WOULD SEE THE PEAKS THAT THEY THOUGHT WERE
2 ASSOCIATED WITH THAT AND THEN THEY SAW A LOT OF OTHER
3 THINGS IN THAT AND THEY DIDN'T KNOW WHAT THEY WERE.

4 THEY USED TO CALL THEM LATE DDT PEAKS,
5 SOMETHING OF THAT SORT.

6 SO THEIR OBJECTIVE WAS SIMPLY TO FIND OUT
7 WHAT WAS THE MOLECULAR STRUCTURE OF THOSE OTHER
8 PEAKS.

9 AND SO THAT WAS WHAT THEY WERE AFTER.

10 ONCE IT WAS DECIDED THAT SOME OF THOSE
11 PEAKS WERE PCB'S, THEN OUR OBJECTIVE WAS A LOT
12 DIFFERENT.

13 WE MANUFACTURED A SPECIFIC KIND OF PCB'S
14 AND THEY WERE CALLED AROCLORS.

15 IT WAS VERY DIFFICULT FOR US AND FOR
16 ANYBODY, FRANKLY, IN THE ENVIRONMENTAL COMMUNITY AT
17 THAT POINT IN TIME TO UNDERSTAND THE RELATIONSHIP
18 BETWEEN THE TWO.

19 Q WHY IS THAT?

20 A WELL, I DON'T THINK THAT WE UNDERSTOOD
21 THE ENVIRONMENTAL TRANSPORT EFFECT AS WE DO NOW.

22 WE WERE IN THE LEARNING PROCESS FOR THAT,
23 HOW THEY ARE WEATHERED, HOW THEY ARE DEGRADED, HOW
24 THEY UNDERGO BIODEGRADATION, THINGS OF THAT SORT.

25 VERY FRANKLY THE PRODUCTS WE MANUFACTURED
26 WERE NOT INTENTIONALLY TREATED IN THE SAME WAY THAT
27 MANY AGRICULTURALS WERE LIKE DDT AND THINGS OF THAT
28 SORT.

1 WE PUT THEM INTO CANS AND THE CANS WENT
2 INTO SOMETHING ELSE AND THEY WEREN'T INTENTIONALLY
3 SPREAD AROUND.

4 IT WAS DIFFICULT TO UNDERSTAND WHERE THEY
5 WERE COMING FROM. WE DIDN'T KNOW AND WE WANTED TO
6 KNOW.

7 SO THAT WAS OUR MISSION.

8 Q NOW, AT SOME TIME IN 1969 OR THEREABOUTS,
9 TOWARD THE END OF THE YEAR, DID YOU PUT TOGETHER A
10 COMPILATION OF THE STUDIES THAT YOU HAD FOUND THAT
11 HAD BEEN PERFORMED BY OTHER RESEARCHERS AS WELL AS
12 YOURSELF IN TAKING A LOOK AT SAMPLES AND WHAT HAD
13 BEEN FOUND?

14 A CORRECT.

15 IT WAS KIND OF LIKE A BASELINE SITUATION
16 AS TO WHERE WE WERE AT.

17 Q AND COULD YOU TURN AROUND AND PULL FROM
18 ONE OF THE BINDERS THEIR EXHIBIT 110.

19 A WHAT VOLUME IS THAT IN?

20 Q I THINK IT'S A BLUE VOLUME UP AT THE TOP
21 THERE.

22 A OKAY. HERE IT IS. I SEE IT.

23 Q NUMBER TWO, I THINK?

24 A RIGHT. I'VE GOT IT.

25 I HAVE EXHIBIT 110.

26 Q NOW IS THIS A DOCUMENT YOU PREPARED, SIR?

27 A YES.

28 Q AND WE WON'T GO OVER ALL OF THIS, BUT WE

1 HAVE REVIEWED THESE BEFORE.

2 I WILL JUST PUT IT UP THERE.

3 WAS THIS A LIST THAT YOU COMPILED, SIR?

4 A YES, SIR.

5 Q AND, AGAIN, THE PURPOSE FOR DOING THAT
6 WAS WHAT?

7 A THE PURPOSE WAS JUST TO KIND OF BRING
8 TOGETHER ALL OF THE THINGS THAT WE HAD BEEN DOING TO
9 THIS POINT IN TIME AND TO KIND OF PUT IT INTO
10 PERSPECTIVE IN A ROUGH DRAFT FORMAT SO WE COULD BEGIN
11 TO START TO PUT THESE TOGETHER, START TO COMMUNICATE
12 THIS TO MANAGEMENT.

13 Q ALL RIGHT. AND A NUMBER OF THE ENTRIES
14 ON HERE INVOLVE WORK THAT YOU YOURSELF HAD DONE; IS
15 THAT RIGHT?

16 A THAT'S CORRECT.

17 Q AND THESE WERE SOME OF THE -- SOME OF
18 THESE WERE WHERE YOU TOOK SAMPLES NEAR A MONSANTO
19 MANUFACTURING SITE; IS THAT RIGHT?

20 A CORRECT.

21 Q AND IN FACT, TOOK SOME AROUND KRUMMRICH
22 AND THE ANNISTON PLANT; IS THAT RIGHT?

23 A THAT'S CORRECT.

24 Q DID YOU ALSO TRY TO LOCATE WHEREVER YOU
25 COULD IN THE SCIENTIFIC LITERATURE, IF YOU WILL,
26 STUDIES DONE BY OTHER RESEARCHERS?

27 A RIGHT.

28 Q AND WITH RESPECT TO THOSE STUDIES, SIR,

1 THAT LOOKED AT FINDINGS OF PCB'S NOT AT A SOURCE
2 SITE, IF YOU WILL, WHAT WERE THE FINDINGS THAT THOSE
3 STUDIES TOLD YOU WITH RESPECT TO THE LEVEL OF
4 CHLORINATION OF THE PCB'S BEING FOUND?

5 A WELL, THE STUDIES TOLD US THEY WERE
6 FINDING PCB'S AND THE STUDIES TOLD US THEY WERE ONLY
7 FINDING THE HIGHER CHLORINATED BIPHENYLS IN THE RANGE
8 OF SIX OR MORE CHLORINES IN THE MOLECULE IS WHAT THEY
9 WERE FINDING WHAT WE CALL THE WEATHERED SAMPLES NOW.

10 Q AND THOSE WOULD BE SAMPLES TAKEN AWAY
11 FROM ANY SOURCE OF PCB?

12 A RIGHT, WAY AWAY FROM ANY POINT SOURCE OF
13 PCB'S.

14 Q NOW, SIR, DID YOU GET INVOLVED IN TAKING
15 A LOOK AT WHETHER PCB'S WOULD BIODEGRADE AND IF SO
16 HOW FAST?

17 A YES.

18 Q AND WHEN DID YOU UNDERTAKE THAT EFFORT,
19 SIR?

20 A I BELIEVE THAT THAT KIND OF WORK WAS DONE
21 AFTER WE HAD THE ABILITY TO MONITOR PCB'S AND PRETTY
22 WELL UNDERSTOOD THAT.

23 IT WAS SOMETIME IN 1969 OR SO.

24 Q AND WHY WAS IT NECESSARY THAT YOU
25 UNDERSTOOD HOW TO ANALYZE THE SAMPLES BEFORE YOU
26 STARTED YOUR BIODEGRADATION STUDIES?

27 A WELL, IF WE DIDN'T KNOW HOW TO ANALYZE
28 FOR THE PCB'S AND THINGS OF THAT SORT, WE COULDN'T

1 TELL WHETHER OR NOT THEY WERE UNDERGOING
2 BIODEGRADATION AND WHAT THE CHANGES WERE.

3 SO IT WAS VERY IMPORTANT THAT WE COULD
4 SEE WHAT IT LOOKED LIKE BEFORE IT WAS EXPOSED TO
5 ORGANISMS THAT WOULD DEGRADE IT AND THEN SEE WHAT IT
6 LOOKED LIKE AFTERWARDS.

7 Q CAN YOU TELL US WHAT A BIODEGRADATION
8 STUDY IS, SIR?

9 A ONE OF THE TECHNIQUES THAT WE EMPLOYED IS
10 CALLED A SEMI-CONTINUOUS ACTIVATED SLUDGE
11 BIODEGRADATION TEST.

12 WHAT THAT BASICALLY INVOLVED IS YOU HAVE
13 A CONTAINER AND YOU GET ACTIVATED SLUDGE FROM A
14 SEWAGE TREATMENT PLANT WHICH IS JUST BASICALLY A
15 BACTERIAL POPULATION.

16 IN FACT, A SEWAGE TREATMENT PLANT IS
17 WHAT, YOU KNOW, WE PUT ALL OF OUR SEWAGE INTO TO BE
18 TREATED.

19 THESE BUGS BIODEGRADE OUR SEWAGE.

20 AND YOU TAKE THIS POPULATION, AND THERE
21 IS THE UNIT DEPICTED THERE.

22 Q EXHIBIT 241, YOUR HONOR.

23 A AND YOU TAKE A KNOWN AMOUNT OF THE
24 BACTERIAL SLUDGE AND YOU WOULD PUT IT INTO THAT UNIT.

25 THEN YOU WOULD FILL IT UP THE REST OF THE
26 WAY WITH WATER AND NUTRIENTS THAT THE BACTERIA NEED
27 TO LIVE WITH.

28 THEN YOU WOULD BUBBLE AIR THROUGH IT,

1 SINCE IT'S AN OXYGEN PROCESS, AN AEROBIC PROCESS THAT
2 TAKES PLACE IN THE PRESENCE OF OXYGEN, AND YOU WOULD
3 INOCULATE IT WITH THE COMPOUND YOU WERE LOOKING TO
4 SEE WHAT IS BIODEGRADABLE.

5 YOU WOULD ALLOW THE UNIT TO PERCH WITH
6 AIR AND SIT FOR 24 HOURS.

7 THEN YOU WOULD STOP THE AIR AND THE
8 SLUDGE WOULD SETTLE OUT. YOU WOULD MEASURE THE
9 SLUDGE VOLUME WHICH GAVE YOU A FEELING OF HOW WELL
10 THE BUGS WERE.

11 THEN YOU WOULD ALSO TAKE A SAMPLE AND YOU
12 WOULD ANALYZE IT FOR WHAT YOU PUT IN.

13 AND THE DIFFERENCE BETWEEN WHAT YOU PUT
14 IN AND WHAT YOU FOUND WAS THE AMOUNT OF MATERIAL
15 DURING THAT PERIOD OF TIME THAT WAS DEGRADED BY THE
16 BUGS.

17 AND WHAT I MEAN BY -- WHAT WE MEAN BY
18 "DEGRADATION" IS WHERE THE ORIGINAL MOLECULE IS
19 CHANGED TO AN EXTENT THAT IT'S NO LONGER THE ORIGINAL
20 MOLECULE.

21 AND IT CAN RANGE FROM MINOR CHANGES ALL
22 THE WAY TO COMPLETE MINERALIZATION TO CARBON DIOXIDE,
23 WATER AND MINERAL SALTS.

24 AND WHAT HAPPENS IS THAT THE BACTERIA
25 SIMPLY USE THAT MOLECULE AS A CARBON SOURCE AND AN
26 ENERGY SOURCE TO MAKE MORE BACTERIA.

27 Q SO, FOR EXAMPLE, IF YOU WERE TAKING A
28 LOOK AT THE BIODEGRADATION OF 1242 YOU WOULD ADD A

1 KNOWN AMOUNT TO THIS?

2 A CORRECT.

3 Q LEAVE IT IN THERE FOR A PERIOD OF TIME
4 AND SEE WHAT IT LOOKED LIKE WHEN YOU EXTRACTED A
5 SAMPLE?

6 A THAT'S CORRECT.

7 THAT PROCESS WAS REPEATED OVER AND OVER.

8 Q AND, AGAIN, WHAT WERE YOU ATTEMPTING TO
9 DO THROUGH THIS EXPERIMENT?

10 A WELL, WE WANTED TO SEE WHETHER THE
11 NATURAL BACTERIA THAT WERE AROUND WERE CAPABLE OF
12 METABOLIZING POLYCHLORINATED BIPHENYLS, THIS HADN'T
13 BEEN SHOWN PREVIOUSLY, AND WHETHER OR NOT THAT WAS
14 PART OF THE REASON THAT, YOU KNOW, WHAT WAS BEING
15 SEEN IN VERY WEATHERED SAMPLES WERE ONLY THE HIGHER
16 CHLORINATED MATERIALS.

17 AT THAT TIME WE DIDN'T KNOW THAT.

18 WE JUST MERELY WANTED TO SEE IF THE
19 WEATHERING WAS DUE TO BIODEGRADATION.

20 Q WHAT WERE YOUR FINDINGS WITH RESPECT TO
21 THE BIODEGRADATION OF THE VARIOUS CHLORINE HOMOLOGS?

22 A WHAT WE FOUND WAS THAT THE BIODEGRADATION
23 WAS RELATABLE TO THE DEGREE OF CHLORINATION.

24 NOW, WHAT THAT MEANS IS THAT BIPHENYL WAS
25 VERY BIODEGRADABLE.

26 MONOCHLORO BIPHENYL WAS BIODEGRADABLE.

27 DICHLOR WAS BIODEGRADABLE.

28 AS YOU ADDED MORE CHLORINES EVENTUALLY

1 THE BIODEGRADABILITY FELL OFF. BECAUSE THE
2 CHLORINES, IF YOU GET ENOUGH OF THEM ON THE RING,
3 PREVENT THE BACTERIA FROM BEING ABLE TO GET IN AND
4 OXIDIZE THE MATERIAL.

5 Q AND DID YOU MAKE ANY DETERMINATION AS TO
6 WHETHER CERTAIN THINGS BIODEGRADE FASTER OR SLOWER
7 THAN OTHERS?

8 A YES.

9 Q AND WHAT WERE YOUR FINDINGS IN THAT
10 REGARD?

11 A WELL, WE FOUND BASICALLY, AGAIN, THAT THE
12 RATE OF BIODEGRADATION WAS PROPORTIONAL TO THE DEGREE
13 OF CHLORINATION.

14 THE MORE CHLORINE, THE LESS
15 BIODEGRADABLE.

16 THE LESS CHLORINE, THE MORE
17 BIODEGRADABLE.

18 Q WHAT WERE YOUR FINDINGS -- FIRST OF ALL,
19 DID YOU DO BIODEGRADATION STUDIES ON 1242
20 SPECIFICALLY?

21 A CORRECT.

22 Q AND WHAT DID YOU FIND WITH RESPECT TO
23 1242?

24 A WHAT WE FOUND WAS THAT THE MAJORITY OF
25 THE BIPHENYL IN 1242 WAS BIODEGRADABLE.

26 IN FACT, DURING THE TIME FRAME THAT WE
27 WERE STUDYING, WHAT WE FOUND WAS THAT MOST OF THE
28 ISOMERS AND HOMOLOGS UP TO PENTACHLOR WERE

1 BIODEGRADABLE.

2 Q UP TO THE FIVE?

3 A RIGHT, SHOWED SOME BIODEGRADATION.

4 AND THAT WAS REALLY KIND OF INTERESTING.

5 BECAUSE THIS WAS SUCH A SHORT PERIOD OF
6 TIME, WE ARE TALKING 24, 48 HOURS. SO WE WERE ABLE
7 TO ACTUALLY USE THEM AS A CARBON AND ENERGY SOURCE.

8 Q NOW, SIR, WHILE YOU WERE DOING THIS WORK
9 AFTER COMING IN LATE '67, '68, '69 AND ON UP TO THE
10 EARLY 70'S, '71, 72, WERE YOU IN COMMUNICATION WITH
11 OTHER LABORATORIES?

12 A YES.

13 Q AND WHAT TYPES OF LABORATORIES WERE YOU
14 IN CONTACT WITH?

15 A WELL, WE WERE IN CONTACT WITH MOST OF ALL
16 OF THE GOVERNMENT LABORATORIES THAT WERE, OF COURSE,
17 INTERESTED IN THIS KIND OF THING.

18 FOR EXAMPLE, THE PATUXENT AND THE MOUND
19 LABS, FISH AND WILDLIFE LABORATORIES, FOOD AND DRUG
20 ADMINISTRATION, WE WERE IN CONTACT WITH THOSE FOLKS
21 TOO, ALL THE ANALYTICAL CHEMISTS WERE INTERESTED IN
22 DEVELOPING METHODOLOGY FOR MEASURING PCB'S.

23 ONE OF THE THINGS WE DID EARLY ON WAS, AS
24 I SAID, ISOLATE MATERIALS THAT COULD BE USED AS
25 STANDARDS AND WE PROVIDED THESE TO ANY AND ALL
26 LABORATORIES THAT WERE INTERESTED IN OBTAINING THESE
27 SO THEY COULD BEGIN DEVELOPING AND ESTABLISHING, IN
28 THEIR OWN LABORATORIES, YOU KNOW, THE ANALYTICAL

1 WHEREWITHAL TO MAKE THESE MEASUREMENTS.

2 THAT INCLUDED OUR CUSTOMERS' LABORATORIES
3 IN SOME INSTANCES WHERE THEY HAD THEM.

4 Q DID YOU PERSONALLY HAVE DIALOGUE WITH
5 ANALYTICAL CHEMISTS WITH BOTH PRIVATE AND
6 GOVERNMENTAL LABORATORIES?

7 A YES, I SPENT A FAIR AMOUNT OF TIME
8 DISCUSSING PCB'S, METHODOLOGIES AT NATIONAL MEETINGS
9 AND AT THEIR LABORATORIES AND THEY AT OURS.

10 Q DID YOU SHARE THE INFORMATION THAT YOU
11 GAINED WITH RESPECT TO BOTH SETTING UP UNITS,
12 EXTRACTION TECHNIQUES AND ANALYSIS TECHNIQUE
13 METHODOLOGIES YOU HAD DEVELOPED?

14 A YES, IT WAS OPENLY SHARED WITH EVERYBODY.

15 Q DID YOU SEEK INFORMATION FROM
16 GOVERNMENTAL RESEARCHERS AND PRIVATE RESEARCHERS TO
17 SEE HOW THEY WERE DOING?

18 A YES, WE DID.

19 AS I MENTIONED EARLIER NONE OF US IN THE
20 ANALYTICAL AREA ARE INTERESTED IN REINVENTING THE
21 WHEEL.

22 IF SOMEBODY HAS ALREADY DONE IT AND WE
23 DON'T HAVE TO SPEND A LOT OF TIME REDOING IT, WE
24 DON'T HAVE TO SPEND A LOT OF TIME ACCOMPLISHING THE
25 SAME OBJECTIVE.

26 Q DID YOU HAVE OCCASION TO REPORT YOUR
27 FINDINGS TO A GROUP OR THE JOINT TASK FORCE?

28 A YES.

1 Q AND WHAT ORGANIZATION OR GROUP WAS THAT,
2 SIR?

3 A I BELIEVE IT WAS THE PRESIDENT'S COUNSEL
4 ON ENVIRONMENTAL QUALITY THAT WAS INTERESTED IN THE
5 PCB SITUATION AND WHAT WAS GOING ON.

6 AND WE PUT TOGETHER A REPORT TO PRESENT
7 WHAT WE KNEW AT THAT POINT IN TIME, WHAT WE HAD
8 DISCOVERED RELATIVE TO PCB'S IN THE ENVIRONMENT, TO
9 UPDATE THE GOVERNMENT BASICALLY ON WHERE WE WERE AT.

10 Q OKAY. AND WHO WOULD ATTEND THE JOINT
11 TASK FORCE PRESENTATION?

12 A I BELIEVE BILL PAPAGEORGE WAS KIND OF
13 LIKE THE CHAIRMAN.

14 THERE WAS MYSELF AND I DISCUSSED A NUMBER
15 OF THINGS.

16 THERE WAS DR. RALPH MUNCH, DR. CUMMING
17 PATON, THERE MAY HAVE BEEN ONE OTHER INDIVIDUAL BUT I
18 THINK THAT WAS PRETTY MUCH THE LIST OF FOLKS.

19 Q AND WHO WAS -- THOSE WERE THE MONSANTO
20 PEOPLE YOU WERE MENTIONING?

21 A THAT'S CORRECT.

22 Q WERE THERE REPRESENTATIVES FROM
23 GOVERNMENT AND OTHER ORGANIZATIONS AS WELL?

24 A YES, A NUMBER OF HIGH LEVEL
25 REPRESENTATIVES OF VARIOUS GOVERNMENTAL AGENCIES AND
26 SCIENTIFIC PARTIES INTERESTED IN WHAT WAS GOING ON.

27 Q AND I WILL SHOW YOU A PORTION -- YOU CAN
28 GET IT, IF YOU LIKE, IT'S EXHIBIT 241.

1 IT'S IN VOLUME FIVE.

2 A THAT IS 241?

3 Q YES, SIR.

4 A OKAY, I HAVE IT.

5 Q AND IF YOU TAKE A LOOK THERE A FEW PAGES
6 IN THERE IS A SECTION THAT GOES "ENTITLED
7 ASSESSMENT"?

8 A YES, SIR.

9 Q "ASSESSMENT OF THE BIOLOGICAL PERSISTENCE
10 OF POLYCHLORINATED BIPHENYLS"?

11 A CORRECT.

12 Q AND THAT IS THE PAPER THAT YOU BASED YOUR
13 PRESENTATION ON, SIR?

14 A YES, IT IS.

15 Q ALL RIGHT. I JUST WANTED TO ASK YOU A
16 COUPLE OF THINGS HERE.

17 YOU INDICATED HERE THAT YOU ARE GOING TO
18 TRY TO ILLUSTRATE THE COMPLEXITY OF THESE MATERIALS
19 AND HENCE THE COMPLEXITY OF THE PROBLEM?

20 A CORRECT.

21 Q AND WHAT DID YOU MEAN BY THAT
22 PHRASEOLOGY, SIR.

23 THIS WAS, AGAIN, WHAT TIME FRAME?

24 A WELL, AS IT SAYS, THIS RESEARCH WAS
25 INITIATED EARLY IN 1969 AFTER DEVELOPMENT AND
26 SUBSEQUENT CONFIRMATION OF SOREN JENSEN'S
27 IDENTIFICATION OF PCB'S RESIDUES IN FISH AND BIRDS IN
28 SWEDEN.

1 Q THAT PARAGRAPH YOU READ IS THE SECOND ONE
2 THERE?

3 A YES.

4 THEY HAVE KIND OF AT LEAST TRIED TO
5 ALLUDE TO, UP TO THIS POINT IN TIME, TO THE
6 COMPLEXITY INVOLVED IN JUST SIMPLY DOING A PCB
7 ANALYSIS OR SHOWING THE PRESENCE OF PCB'S IN
8 ENVIRONMENTAL SAMPLES, WHAT YOU HAD TO DO TO THAT.

9 THAT IS WHAT I MEAN BY THE COMPLEXITY OF
10 THE PROBLEM.

11 THAT WAS ONE LEVEL OF COMPLEXITY.

12 THE OTHER KIND OF LEVEL OF COMPLEXITY WAS
13 TO TRY TO UNDERSTAND WHAT WAS HAPPENING IN THE
14 ENVIRONMENT IN TERMS OF TRANSPORT PROPERTIES AND
15 WEATHERING PROPERTIES AND BIODEGRADATION, THINGS OF
16 THAT SORT. WE JUST DIDN'T REALLY KNOW WHAT WAS GOING
17 ON.

18 WE HAD TO FIGURE OUT WHAT WAS GOING ON.

19 SO THAT WAS ANOTHER LEVEL OF COMPLEXITY
20 ASSOCIATED WITH THIS.

21 AND IT JUST -- WE JUST REALLY WERE, AT
22 THAT POINT IN TIME, I GUESS, YOU KNOW, THAT IS 20, 25
23 YEARS AGO.

24 WE WERE JUST BEGINNING TO UNDERSTAND SOME
25 OF THE THINGS GOING ON ENVIRONMENTALLY.

26 Q WHEN YOU SAY THE "TRANSPORT," WHAT DO YOU
27 MEAN BY THAT?

28 A WELL, IT'S VERY DIFFICULT TO UNDERSTAND

1 HOW SOMETHING GETS FROM ONE PLACE TO THE OTHER WHEN
2 IT'S NOT SOLUBLE OR ANYTHING, NOT VERY VOLATILE.
3 THOSE ARE THE KIND OF PROPERTIES THAT PCB'S HAD.

4 THEY WERE HIGH BOILING, NOT SOLUBLE IN
5 WATER.

6 THEY WEREN'T INTENTIONALLY TRANSPORTED
7 ALL OVER THE PLACE.

8 SO IT WAS VERY DIFFICULT TO UNDERSTAND
9 HOW, IN THE MIDDLE OF THE OCEAN OR SOMEPLACE ELSE
10 LIKE THAT, THAT YOU COULD FIND PCB'S.

11 AND WE WEREN'T FINDING AROCLORS. WE WERE
12 FINDING PCB'S.

13 Q NOW, AS OF THE TIME YOU MADE YOUR
14 PRESENTATION TO THE JOINT TASK FORCE, SIR, HAD ALL
15 THE METHODOLOGY FOR ANALYSIS BEEN SET AND AGREED UPON
16 BY ALL THE ANALYTIC CHEMISTS?

17 A NO.

18 I THINK EVEN TODAY ANALYTICAL
19 METHODOLOGY, MEANS OF SEPARATING PCB'S AND
20 IDENTIFYING THEM AND QUANTIFYING THEM IS STILL
21 DYNAMIC IN A SENSE.

22 HOWEVER, TODAY, IN SOME AREAS, SOME OF
23 THE PROCEDURES WHICH ARE EMPLOYED HAVE BEEN CODIFIED
24 IN THE FEDERAL REGISTER AND ARE PART OF THE RECORD
25 PROGRAMS, THE TSCA PROGRAMS, THINGS OF THAT SORT.

26 YOU KNOW, THE DEVELOPMENT AND THE
27 UNDERSTANDING OF THE METHODOLOGY, HOW TO PUT SAMPLES
28 THROUGH FASTER, HOW TO HANDLE THE DATA BETTER, HOW TO

1 MAKE IT MORE PRECISE, THOSE KIND OF THINGS CONTINUE
2 TO OCCUR.

3 EVEN IN ACCORDANCE WITH PCB SCIENTISTS
4 TODAY ARE STILL HAPPENING.

5 Q AND THEY WERE CERTAINLY EVOLVING IN THE
6 1972 TIME FRAME OF THE JOINT TASK FORCE PRESENTATION?

7 A YES.

8 THE COURT: MR. PREUSS, WE HAVE REACHED THE
9 TIME OF THE NOON RECESS.

10 LADIES AND GENTLEMEN, WE WILL BE IN
11 RECESS UNTIL 1:30.

12 PLEASE RETURN JUST BEFORE THEN.

13 THANK YOU.

14 (AT 12:00 NOON, A RECESS WAS TAKEN
15 UNTIL 1:40 P.M. OF THE SAME DAY.)
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1 LOS ANGELES, CALIFORNIA; MONDAY, DECEMBER 20, 1993

2 1:40 P.M.

3 DEPARTMENT NO. 31 G. KEITH WISOT, JUDGE

4 ---0---

5 (APPEARANCES AS HERETOFORE NOTED.)

6 (DAVID A. SALYER, OFFICIAL REPORTER.)

7
8 THE COURT: AND RESUMING.

9 GO AHEAD, MR. PREUSS.

10 MR. PREUSS: THANK YOU.

11
12 EARL SCOTT TUCKER,
13 CALLED AS A WITNESS BY THE DEFENDANT, MONSANTO,
14 HAVING BEEN PREVIOUSLY SWORN TESTIFIED AS FOLLOWS:
15

16 DIRECT EXAMINATION (CONTINUED.)

17 BY MR. PREUSS:

18 Q DR. TUCKER, A COUPLE OF POINTS I WOULD
19 LIKE TO MAKE TO MAKE SURE THAT WE CLEAR UP.

20 WE HAVE TALKED ABOUT PCB'S IN AROCLOR.

21 IS THERE A DIFFERENCE THERE, SIR?

22 A YES, THERE IS.

23 AROCLORS CONTAIN PCB'S.

24 BUT THEY ARE A DISTINCT PRODUCT
25 MANUFACTURED BY MONSANTO.

26 AND SO WHILE THEY CONTAIN PCB'S, THEY ARE
27 NOT SYNONYMOUS TERMINOLOGY.

28 Q AND GOING BACK TO THE REPORTED FINDINGS

1 OF WIDMARK AND JENSEN, DID THEY REPORT FINDING PCB'S
2 OR AROCLOR?

3 A THEY REPORTED FINDING PCB'S AND, IN FACT,
4 DID NOT FIND PCB DISTRIBUTIONS THAT WERE EQUIVALENT
5 TO MONSANTO AROCLOR PRODUCTS.

6 Q AT SOME POINT DID MONSANTO PROVIDE
7 AROCLOR SAMPLES TO WIDMARK AND JENSEN AS WELL AS
8 OTHER RESEARCHERS?

9 A YES, YES.

10 WE WERE ONE OF THE MAJOR, AS THE SOLE
11 U.S. MANUFACTURER OF PCB'S, WE WERE ONE OF THE SOLE
12 SUPPLIERS OF AROCLOR PRODUCTS WHICH WERE USED AS
13 STANDARDS.

14 IT OFTEN LED TO A LOT OF CONFUSION IN THE
15 SENSE THAT EVERYTHING WAS RELATED TO THE AROCLOR
16 PRODUCTS, WHETHER THEY WERE DISTINCTLY AROCLOR
17 PRODUCTS OR NOT.

18 IN OTHER WORDS, IF THEY FOUND PCB'S OF
19 ANY KIND WHATSOEVER, EVEN THOUGH THEY WEREN'T EXACTLY
20 LIKE THE AROCLOR PRODUCTS IN TERMS OF DISTRIBUTION,
21 THEY WERE SOMETIMES CALLED AROCLORS.

22 SO THE TWO TERMS BECAME SYNONYMOUS, EVEN
23 THOUGH THEY WEREN'T.

24 Q NOW, WE TALKED ABOUT EXHIBIT 210.

25 I WILL JUST PUT IT ON HERE TO REFRESH YOU
26 AS TO WHAT WE ARE TALKING ABOUT.

27 YOU PUT THAT TOGETHER AT THE END OF 1969,
28 SHOWING ALL THE TEST ANALYSIS THAT HAD BEEN PERFORMED

1 THAT YOU WERE ABLE TO COME UP WITH IN THE LITERATURE
2 AS WELL AS WHAT YOU HAD DONE; IS THAT CORRECT?

3 A THAT IS CORRECT.

4 THOSE WERE THE RESULTS WE HAD FOUND, HAD
5 BEEN SUPPLIED TO US OR THAT WE HAD GENERATED
6 OURSELVES.

7 THE LIST WAS TO DETERMINE WHERE THE PCB'S
8 WERE FOUND, WITH WHAT EFFICACY AND WHETHER OR NOT IT
9 WAS A PCB OR AN AROCLOR OR JUST WHAT WAS IT.

10 Q AS OF THE END OF 1969, SIR, WERE YOU
11 AWARE OF ANY LAB THAT WAS DOING ANY MORE WORK THAN
12 YOU WERE IN TERMS OF ANALYSIS OF KNOWN AND UNKNOWN
13 SAMPLES IN THE ENVIRONMENT?

14 A NOT SPECIFICALLY FOR PCB'S, NO.

15 MONSANTO HAD THE ONE LAB THAT WAS REALLY
16 FOCUSED ON DOING PCB ANALYSIS.

17 MOST OF THE OTHER LABORATORIES WERE DOING
18 PESTICIDE ANALYSIS.

19 IN DOING THE PESTICIDE ANALYSIS THEY WERE
20 FINDING PCB'S.

21 BUT THE METHOD AND PROCEDURES THEY
22 EMPLOYED HAD NOT BEEN VALIDATED FOR PCB'S.

23 THEY HAD BEEN VALIDATED FOR PESTICIDES.

24 AS I SAID EARLIER, THESE FOLKS WERE
25 INTERESTED IN THE INTERFERENCE IT WAS CAUSING WITH
26 WHAT THEY WERE MEASURING FROM THAT VIEWPOINT ONLY.

27 BUT WE WERE MORE INTERESTED IN PCB'S AND
28 PCB'S ONLY.

1 ALL OF OUR PROCEDURES WERE VALIDATED FOR
2 PCB'S.

3 Q IN THE TIME FRAME, LATE '69, EARLY 70'S,
4 HOW MANY LABORATORIES THAT YOU WERE AWARE OF IN
5 CONNECTION WITH YOUR DIALOGUE WERE CAPABLE OF
6 ANALYZING PCB SAMPLES?

7 A THEY WERE PROBABLY A HANDFUL.

8 THEY WERE NOT MANY AT ALL THAT WERE
9 CAPABLE AND EXPERIENCED IN PCB ANALYSIS.

10 BECAUSE, YOU KNOW, SIMPLY THE FIRST
11 FINDING OF THOSE MATERIALS BY A PROCEDURE THAT WAS
12 MEANT FOR SOMETHING ELSE OCCURRED IN LATE 1966.

13 Q AND WE ARE TALKING WORLDWIDE?

14 A YES.

15 Q AND AS OF, LET'S SAY, THE END OF 1969,
16 EARLY 1970 HAD MONSANTO PROGRESSED BEYOND THE
17 METHODOLOGY AND ANALYTIC TECHNIQUES USED BY JENSEN
18 AND WIDMARK ACCORDING TO YOUR UNDERSTANDING?

19 A CORRECT.

20 WE HAD ESTABLISHED THE BASIS THAT WAS TO
21 BE USED IN THE FUTURE FOR MOST IF NOT ALL OF THE
22 REGULATORY ANALYTICAL METHODOLOGIES USED TO MEASURE
23 PCB'S NOWADAYS.

24 Q YOU ARE SAYING THAT THE METHODOLOGIES
25 THAT YOU DEVELOPED AND HAVE DISCUSSED WITH US FORMED
26 THE FOUNDATION OF THE METHODOLOGY THAT HAS BEEN
27 APPROVED REGULATORILY TODAY FOR ANALYSIS OF PCB'S?

28 A THAT IS CORRECT.

1 THESE WERE WIDELY SHARED WITH GOVERNMENT
2 AGENCIES, VIRTUALLY ANYBODY WHO WAS INTERESTED IN HOW
3 TO DO IT.

4 WE SHARED THAT EXPERIENCE WITH THEM.

5 Q AND PICKING UP, SAY, AROUND 1970, SHORTLY
6 AFTER YOU PREPARED EXHIBIT 110 HERE, SIR, TELL US
7 WHAT YOU WERE DOING IN THE EARLY 70'S IN CONTINUING
8 YOUR ANALYSIS OF SAMPLES CALLED KNOWN AND UNKNOWN IN
9 THE ENVIRONMENT OR ELSEWHERE?

10 A WE HAD JUST REALLY GOTTEN TO THE POINT
11 WHERE WE WERE FEELING VERY COMFORTABLE IN ANALYZING
12 ENVIRONMENTAL SAMPLES.

13 BY THAT, I MEAN WATER AND SOME OF THE
14 OTHER KINDS FOR PCB'S AND BEGINNING TO TRUST OUR
15 RESULTS IN TERMS OF HAVING ENOUGH PRACTICE TO EXECUTE
16 THE STANDARD OPERATING PROCEDURES CORRECTLY.

17 AND, IN FACT, FOR MY OWN EDUCATION, I
18 LOOKED AT THE PUBLICATIONS AND I PLOTTED THE DATES
19 VERSUS THE YEAR, THE NUMBER OF PUBLICATIONS VERSUS
20 THE YEAR.

21 I THINK IN 1966 THERE WERE THREE
22 PUBLICATIONS NOTED ON PCB'S AND THEN IN 1967 I THINK
23 THERE WERE SOMETHING LIKE THREE AND THEN SEVEN IN
24 1968.

25 IN 1969 THERE WERE 93.

26 THE BULK OF THOSE PCB FINDINGS WERE
27 MONSANTO'S.

28 Q AND YOU CONTINUED THAT WORK ON IN THROUGH

1 THE 1970'S?

2 A YES, SIR.

3 Q WERE YOU ALSO DOING BIODEGRADATION
4 STUDIES IN THE 1970'S?

5 A CORRECT.

6 ONCE WE HAD ESTABLISHED METHODOLOGIES,
7 THERE WERE -- THERE BECAME A FAIRLY LARGE NUMBER OF
8 PEOPLE INVOLVED IN PROVIDING CUSTOMER SUPPORT,
9 PROVIDING ENVIRONMENTAL ANALYSIS AND EXPANDING OUR
10 KNOWLEDGE OF PCB'S AND WHERE THEY WERE AT AND THE
11 FREQUENCIES, THINGS OF THAT SORT.

12 Q TAKING THE TIME FRAME LATE 60'S AND EARLY
13 70'S, SIR, HOW MANY PEOPLE AT MONSANTO WERE WORKING
14 WITH YOU ON THIS ANALYTIC EFFORT TO BOTH DEVELOP
15 EQUIPMENT AND METHODOLOGIES FOR ANALYZING BOTH
16 QUANTITATIVELY AND QUALITATIVELY THE SAMPLES?

17 A I WOULD GUESS IN ST. LOUIS AT OUR
18 LABORATORIES WE HAD PROBABLY 20 PEOPLE OR SO INVOLVED
19 IN THAT KIND OF THING, JUST DOING PCB ANALYSIS.

20 AND, IN FACT, WE WERE USING SO MANY
21 SOLVENTS THAT THE COMPANY WHO SUPPLIES THE SOLVENTS
22 ESTABLISHED AN OVERSIGHT LOCATION FOR THE SOLVENTS SO
23 THEY COULD DELIVER THEM TO US DAILY.

24 THE SOLVENTS WERE USED TO EXTRACT SAMPLES
25 TO OBTAIN THE PCB'S OUT OF THOSE SAMPLES.

26 MR. PREUSS: THANK YOU, SIR, NO, FURTHER
27 QUESTIONS.

28 THE COURT: MS. GRADY.

1 MS. GRADY: THANK YOU, YOUR HONOR.

2

3

CROSS EXAMINATION

4

BY MS. GRADY:

5

Q GOOD AFTERNOON, DR. TUCKER.

6

A GOOD AFTERNOON.

7

Q I WOULD LIKE TO GO BACK AND TALK A LITTLE
8 BIT ABOUT THE CHRONOLOGY, ABOUT HOW YOU CAME TO THIS
9 PCB PROBLEM AND FILL IN A FEW SPECIFIC DATES.

10

NOW, YOU STARTED WORKING FOR MONSANTO IN
11 THE FOURTH QUARTER OF 1967, RIGHT?

12

A CORRECT, I BELIEVE IT WAS IN SEPTEMBER OF
13 1967.

14

Q OKAY. AND YOU WERE FRESH OUT OF THE
15 UNIVERSITY OF IOWA?

16

A YES, I JUST COMPLETED MY PH.D STUDIES AND
17 SUBMITTED MY THESIS FOR APPROVAL.

18

Q BUT YOU HADN'T YET RECEIVED YOUR THESIS?

19

A THAT'S CORRECT.

20

Q AND YOUR FIRST ASSIGNMENT AT MONSANTO
21 DIDN'T HAVE ANYTHING TO DO WITH PCB'S, RIGHT?

22

A THAT'S CORRECT.

23

Q YOUR FIRST ASSIGNMENT WITH MONSANTO WAS
24 IN THE ATOMIC EMISSION AREA AND INVOLVED METAL
25 SPECTROSCOPY, RIGHT?

26

A YES.

27

Q METAL SPECTROSCOPY IS WHAT YOU HAD
28 ACTUALLY DONE IN YOUR GRADUATE WORK; IS THAT RIGHT?

1 A NO, THAT'S NOT TRUE.

2 I COULD SEE HOW YOU MIGHT SURMISE THAT,
3 BUT WHAT I DID PRIMARILY WAS PREPARE ORGANIC
4 COMPOUNDS THAT ARE KNOWN AS LIGGINS (PH) THAT COMBINE
5 WITH UNIQUE METTALINES AND FORM HIGHLY COLORED
6 SPECIMENS THAT COULD BE USED TO DETECT THE METTALINES
7 IN VARIOUS DIFFERENT SAMPLES.

8 THAT IS DIFFERENT METAL AND SOURCE
9 SPECTROSCOPY.

10 Q WHAT YOU WERE DOING IN YOUR FIRST
11 ASSIGNMENT IS ABSORPTION SPECTROGRAPHY?

12 A THAT IS CORRECT.

13 Q YOU HAD PUBLISHED IN THE AREA OF THE
14 IDENTIFICATION OF METALS, RIGHT?

15 A YOU MEAN THE EARLIER PUBLICATIONS ON
16 CHELATES AND THINGS OF THAT SORT? YES.

17 Q I'M REFERRING TO YOUR DECEMBER 1960
18 ARTICLE IN ANALYTICAL CHEMISTRY.

19 A ON DETERMINATION OF IRON?

20 Q YES.

21 A YES, MA'AM.

22 Q CAN YOU TELL ME, IS IT THE "JOURNAL OF
23 ANALYTICAL CHEMISTRY"?

24 A IT'S JUST CALLED "ANALYTICAL CHEMISTRY,"
25 NOT THE JOURNAL OF.

26 Q YOU ARE FAMILIAR WITH THAT PUBLICATION?

27 A YES, MA'AM.

28 Q AND YOU HAD A SUBSCRIPTION TO THAT

1 PUBLICATION?

2 A YES, MA'AM.

3 Q WHAT IS "ANALYTICAL CHEMISTRY," THE
4 PUBLICATION NOT THE FIELD?

5 A A PUBLICATION BY THE AMERICAN CHEMICAL
6 SOCIETY THAT PUBLISHES ANALYTICAL CHEMISTRY METHODS
7 AND IS FOLLOWED BY SCIENTISTS WHO ARE ANALYTICAL
8 CHEMISTS.

9 Q IS THAT A PEER-REVIEW JOURNAL?

10 A YES, IT IS PEER REVIEW.

11 Q SO YOU HAD THIS FIRST ASSIGNMENT THAT
12 INVOLVED ATOMIC ABSORPTION SPECTROMETRY AND THEN
13 ABOUT SIX MONTHS AFTER YOU ARRIVED AT MONSANTO YOU
14 WERE APPROACHED BY DR. KELLER WITH A NEW ASSIGNMENT,
15 RIGHT?

16 A I'M NOT SURE IF IT WAS EXACTLY SIX
17 MONTHS, BUT I DID THE ATOMIC ABSORPTION AND THEN I
18 THINK LATE '67, EARLY '68 I WAS GIVEN THE ASSIGNMENT
19 OF THE PCB STUDIES, YES.

20 Q WELL, YOUR BEST RECOLLECTION IS THAT IT
21 WAS SIX MONTHS OR LONGER AFTER YOU STARTED AT
22 MONSANTO THAT YOU WERE GIVEN THE ASSIGNMENT
23 CONCERNING PCB'S, RIGHT?

24 A THAT SOUNDS REASONABLE.

25 I HAVE NO REASON TO QUESTION THAT.

26 Q THAT WOULD TAKE US PAST 1967, RIGHT?

27 IF YOU STARTED IN SEPTEMBER OF 1967 AND
28 YOUR BEST RECOLLECTION IS THAT IT WAS AT LEAST SIX

1 MONTHS BEFORE DR. KELLER APPROACHED YOU, THAT WOULD
2 TAKE US INTO 1968, RIGHT?

3 A SIX MONTHS WOULD TAKE US INTO 1968, YES.

4 Q OKAY. NOW, AT THE TIME YOU JOINED
5 MONSANTO YOU HADN'T DONE ANY WORK WITH
6 POLYCHLORINATED BIPHENYLS, RIGHT?

7 A NO, MA'AM.

8 Q AND YOU HAD HAD NO INVOLVEMENT
9 WITH MONSANTO'S PCB PRODUCT AROCLORS, RIGHT?

10 A NO, I DID NOT.

11 Q AND YOU HAD NEVER USED A GAS
12 CHROMATOGRAPH, RIGHT?

13 A I WAS FAMILIAR WITH THEM IN THEORY AND
14 HAD TAKEN COURSES IN WHICH I HAD USED A GAS
15 CHROMATOGRAPH, BUT I WASN'T EXPERIENCED IN GAS
16 CHROMATOGRAPHY, SO TO SPEAK.

17 Q YOU HAD USED A GAS CHROMATOGRAPH?

18 A YES.

19 Q OKAY. READING FROM DR. TUCKER'S
20 DEPOSITION TAKEN THE 23RD OF JUNE, 1992, STARTING AT
21 PAGE 33, LINE 24 AND CONTINUING THROUGH PAGE 34 LINE
22 5.

23 THE COURT: GO AHEAD.

24 MS. GRADY: (READING):

25 "Q. HAVE YOU PERSONALLY
26 DONE ANY OF THE SORT OF WORK OR
27 WORK SIMILAR TO WHAT JENSEN AND
28 WIDMARK HAD DONE PRIOR TO YOUR

1 CONVERSATION WITH DR. KELLER?

2 "A. NO.

3 "Q. HAD YOU EVER USED THE
4 GAS CHROMATOGRAPH?

5 "A. NO."

6 Q PRIOR TO YOUR ASSIGNMENT BY DR. KELLER,
7 YOU HAD NEVER USED A MASS SPECTROMETER, HAD YOU?

8 A NO.

9 AND IF I'M PERMITTED, I WOULD LIKE TO
10 EXPLAIN THE DIFFERENCE IN THOSE ANSWERS.

11 Q I'M SURE MR. PREUSS WILL ASK YOU ABOUT
12 THAT.

13 A FINE.

14 Q PRIOR TO YOUR ASSIGNMENT WITH DR. KELLER
15 YOU HAD NEVER USED AN ELECTRON CAPTURE DEVICE, RIGHT?

16 A THAT'S CORRECT.

17 Q NOW, WHEN DR. KELLER CAME TO YOU, WHAT HE
18 TOLD YOU HE WANTED YOU TO DO WAS TO DEVELOP
19 ANALYTICAL METHODOLOGIES FOR PCB'S, RIGHT?

20 A CORRECT.

21 Q WHEN DR. KELLER GAVE YOU THIS ASSIGNMENT
22 DID HE TELL YOU, SOMETIME IN 1968, DID HE TELL YOU
23 THAT HE PERSONALLY HAD BEEN CONVINCED OF THE VALIDITY
24 OF JENSEN AND WIDMARK'S WORK SINCE THE END OF 1967?

25 A NO.

26 Q DID YOU HAVE OCCASION AROUND THE TIME
27 WHEN YOU FIRST GOT YOUR ASSIGNMENT FROM DR. KELLER TO
28 HAVE CONVERSATIONS WITH DR. EMMET KELLY, MONSANTO'S

1 MEDICAL DIRECTOR ABOUT PCB'S?

2 A I DON'T RECALL MUCH, IF ANY, INTERACTION
3 WITH DR. KELLY.

4 Q NOW, YOU WERE SUPPOSED TO FIGURE OUT IF
5 WHAT JENSEN AND WIDMARK HAD FOUND WAS REALLY PCB'S,
6 RIGHT?

7 A THE INITIAL ASSIGNMENT WAS TO REPRODUCE
8 WHAT JENSEN AND WIDMARK DID AND TO VERIFY THAT WHAT
9 THEY FOUND WERE POLYCHLORINATED BIPHENYLS, YES.

10 Q AND BY THE TIME YOU GOT YOUR ASSIGNMENT
11 IT WASN'T JUST JENSEN AND WIDMARK THAT HAD FOUND
12 PCB'S, RIGHT?

13 A I BELIEVE IN -- AT THAT POINT IN TIME
14 THERE HAD PROBABLY BEEN ABOUT THREE PUBLICATIONS
15 AVAILABLE, EITHER IN THE LITERATURE -- THEY WEREN'T
16 IN THE LITERATURE QUITE YET.

17 Q SO YOU WERE NOT ONLY SEEKING TO VALIDATE
18 JENSEN AND WIDMARK'S WORK YOU WERE LOOKING AT THE
19 WORKS OF HOLMES, SIMMONS AND TATTON, RIGHT?

20 A YES.

21 Q AND THOSE WERE GENTLEMEN WHO WORKED FOR
22 THE LABORATORY OF THE GOVERNMENT CHEMIST IN LONDON
23 AND THEY, TOO, HAD FOUND PCB'S IN THE ENVIRONMENT,
24 RIGHT?

25 A THAT'S CORRECT.

26 I BELIEVE THAT -- I THINK THEY ALSO -- I
27 DON'T KNOW WHETHER THEY HAD DONE GC MASS SPEC WORK.

28 I KNOW THERE WERE A LOT OF PEOPLE THAT

1 DEDUCED THAT, THAT THE THINGS THEY HAD BEEN SEEING,
2 THAT SOREN JENSEN AND WIDMARK HAD BEEN SEEING, "OH,
3 YEAH, THOSE MUST BE PCB'S."

4 I THINK THOSE WERE SOME OF THE OTHER
5 PEOPLE WHO DID ASPECT WORK, BUT I'M NOT SURE.

6 Q DO YOU RECALL THEY PUBLISHED THEIR WORK
7 IN OCTOBER OF 1967?

8 A NATURE, I BELIEVE IT WAS PUBLISHED.

9 Q THAT WAS PART OF THE WORK YOU LOOKED AT
10 AFTER YOU GOT YOUR ASSIGNMENT, RIGHT?

11 A YES, IT WOULD HAVE BEEN.

12 Q WHY DON'T WE GO AHEAD AND LOOK AT EXHIBIT
13 NUMBER 52.

14 IT'S PROBABLY IN THE FIRST BINDER.

15 A IT'S IN THE SECOND BINDER.

16 Q THE SECOND BINDER, SORRY.

17 A THAT'S NO PROBLEM.

18 Q DO YOU HAVE THAT IN FRONT OF YOU,
19 DR. TUCKER?

20 A YES, MA'AM, EXHIBIT 52.

21 Q OKAY. LOOK AT THE SECOND PAGE OF EXHIBIT
22 52.

23 IT HAS A DATE DOWN AT THE BOTTOM.

24 OH, LET ME MOVE THIS WHITE BOARD.

25 DO YOU SEE THE DATE AT THE BOTTOM JULY
26 18TH, 1968?

27 A YES, MA'AM.

28 Q AND DOWN AT THE BOTTOM IT ALSO SAYS,

1 "SOURCE E. WHEELER," THAT WAS ELMER
2 WHEELER --

3 A RIGHT.

4 Q -- "AND SCOTT TUCKER," THAT'S YOU, RIGHT?

5 A CORRECT.

6 Q WHAT EXHIBIT 52 IS IS AN INTERNAL BUDGET
7 DOCUMENT THAT BUDGETS MAN-HOURS AGAINST TASKS, RIGHT?

8 A I THINK IT'S A MONTHLY SUMMARY BUT IT
9 DOES HAVE IT IN IT.

10 YES.

11 Q OKAY. AND ON THE SECOND PAGE OF EXHIBIT
12 58 WE SEE THE WORK THAT YOU WERE DOING, RIGHT, UNDER
13 "RESPONSIBILITIES"?

14 A YES.

15 Q IT SAYS, "REK," THAT IS DR. KELLER,
16 RIGHT?

17 A UH-HUH.

18 Q AND DR. KELLER WAS YOUR BOSS?

19 A YES.

20 Q "AND ST," THAT IS SCOTT TUCKER, THAT IS
21 YOU?

22 A YES.

23 Q AND IT SAYS THAT YOUR RESPONSIBILITY IS
24 TO ASSESS THE VALIDITY OF ANALYTICAL METHODS USED BY
25 WORKERS IN THE FIELD.

26 AND IT GIVES A DATE, A TARGET DATE OF
27 3-69?

28 A UH-HUH. YES.

1 Q NOW, THAT IS REFERRING TO THE ASSIGNMENT
2 THAT DR. KELLER GAVE YOU, RIGHT?

3 A I BELIEVE IT'S REFERRING TO AN ASSIGNMENT
4 THAT DR. KELLER AND I HAD THAT DR. KELLER SHARED WITH
5 ME.

6 Q THAT WAS TO ASSESS THE VALIDITY OF THE
7 ANALYTICAL METHODS USED BY WORKERS IN THE FIELD WHO
8 WERE LOOKING AT PCB'S, RIGHT?

9 A CORRECT.

10 Q THIS WAS TO ASSESS THE VALIDITY OF JENSEN
11 AND WIDMARK'S WORK AND THE OTHER PEOPLE WHO BY 7-68
12 HAD REPORTED FINDING PCB'S?

13 A CORRECT.

14 Q OKAY. NOW, DOES THIS 7-68, JULY '68
15 DOCUMENT REFRESH YOUR RECOLLECTION IN ANY WAY ABOUT
16 WHEN YOU RECEIVED YOUR ASSIGNMENT FROM DR. KELLY?

17 A NOT REALLY.

18 THE ASSIGNMENT COULD HAVE OCCURRED
19 EARLIER.

20 NOT ACTUALLY.

21 I KNOW IT WAS CERTAINLY BEFORE 3-69 AND
22 CERTAINLY BEFORE JULY 18, 1968.

23 Q HOW MUCH BEFORE JULY 18, 1968 YOU DON'T
24 KNOW?

25 A NO.

26 Q DO YOU REMEMBER THIS TARGET DATE OF 3-69?

27 A NO, I DON'T REMEMBER THAT TARGET DATE
28 SPECIFICALLY.

1 Q BY MARCH, 1969 HAD YOU COMPLETED YOUR
2 ASSESSMENT OF THE VALIDITY OF JENSEN AND WIDMARK'S
3 WORK?

4 A I WAS TARGETED AT THAT POINT IN TIME TO
5 COMPLETE THAT.

6 I MIGHT SAY IT WASN'T JUST JENSEN AND
7 WIDMARK BUT WHOEVER WAS PUBLISHING MATERIAL IN THAT
8 AREA.

9 Q THERE WERE OTHERS?

10 A THERE WERE OTHERS THAT CAME ALONG.

11 Q BY MARCH, 1969, LOOKING FORWARD IN THE
12 CHRONOLOGY, DID YOU -- HAD YOU DETERMINED THE
13 VALIDITY OF THE PEOPLE IN THE FIELD, THE ASSIGNMENTS
14 IN THE FIELD WHO WERE REPORTING FINDING PCB'S IN THE
15 ENVIRONMENT?

16 A YES.

17 Q THE SECOND THING IT LISTS HERE WITH YOUR
18 NAME NEXT TO IT, SCOTT TUCKER, THESE OTHER PEOPLE,
19 W.R.R., THAT IS DR. RICHARD?

20 A RIGHT.

21 Q AND WHO WAS DR. RICHARD?

22 A DR. RICHARD WAS THE DIRECTOR OF THE
23 FUNCTIONAL FLUIDS GROUP.

24 Q I FORGOT TO ASK YOU, WHO WAS DR. KELLER,
25 YOUR BOSS?

26 A WHO WAS HE?

27 Q YES.

28 A HE WAS MY BOSS.

1 HE WAS MANAGER OF WHAT WE CALL THE
2 APPLIED SCIENCES AT THAT TIME THAT WAS AN ANALYTICAL
3 DEPARTMENT THAT SUPPORTED THE ORGANICS DIVISION AND
4 THE FUNCTIONAL FLUIDS WAS A PORTION OF THAT
5 DIVISION.

6 Q OKAY. AND ELMER WHEELER, THIS IS E.W.,
7 IS ELMER WHEELER, RIGHT?

8 A THAT IS CORRECT.

9 Q WHO WAS MR. WHEELER?

10 A HE WAS IN THE MEDICAL DEPARTMENT IN THE
11 TOXICOLOGY AREA, IF I REMEMBER CORRECTLY.

12 Q NOW, IT ALSO LISTS YOUR ASSIGNMENT AT
13 THIS TIME, JULY OF '68, AS COLLECT INFORMATION ON ALL
14 WORK BEING DONE BY OTHERS IN THIS FIELD.

15 IT LISTS THE TARGET DATE FOR THAT
16 ASSIGNMENT AS CONTINUING?

17 A CORRECT.

18 Q IN THE SUMMER OF '68 WERE YOU GOING ABOUT
19 FINDING OUT ALL OF THE VARIOUS RESEARCH THAT WAS
20 BEING DONE ON PCB'S?

21 A YES.

22 Q HOW DID YOU GO ABOUT DOING THAT?

23 A WELL, BY MONITORING PUBLICATIONS, BY
24 TALKING TO PEOPLE WHO WERE ACTIVE IN THE FIELD AND IT
25 WASN'T JUST ME.

26 THERE WERE MANY OF THE PEOPLE WITHIN THE
27 COMPANY WHO VISITED SOME OF THE RESEARCHERS DOING
28 THAT KIND OF WORK. AND THAT INCLUDED AT SOME POINT

1 IN TIME VISITS TO JENSEN AND WIDMARK AND TO
2 RICHARDSON AND SOME OF THE OTHER FOLKS.

3 Q YOU NEVER VISITED DR. JENSEN, DID YOU?

4 A NO, MA'AM, I DID NOT.

5 Q AND THE VISITS YOU'RE REFERRING TO DIDN'T
6 TAKE PLACE UNTIL THE SUMMER OF '69, DID THEY?

7 A THERE WERE VISITS FROM THE PEOPLE IN THE
8 UNITED STATES AND THERE WERE VISITS FROM PEOPLE IN
9 EUROPE WHO ACTUALLY WENT AND TALKED TO WIDMARK AND
10 JENSEN.

11 Q DAVE WOOD, WE HAVE HEARD TESTIMONY IN
12 THIS CASE ALREADY, DAVE WOOD FROM MONSANTO'S EUROPEAN
13 OFFICES WENT OVER AND TALKED TO JENSEN ABOUT A MONTH
14 AFTER THE FIRST REPORT OF HIS RESEARCH?

15 A RIGHT.

16 THAT WAS IN --

17 Q 1966, RIGHT?

18 A RIGHT.

19 Q ARE YOU TALKING ABOUT OTHER VISITS TO
20 JENSEN, OTHER THAN MR. WOOD IN DECEMBER, 1966 AND
21 DR. KELLER, DR. RICHARD AND MR. WHEELER IN THE SUMMER
22 OF '69?

23 A NO, I'M NOT.

24 Q DID YOU EVER CALL UP DR. JENSEN ON THE
25 PHONE AND TALK TO HIM ABOUT THIS RESEARCH?

26 A NO, I DID NOT.

27 Q OKAY. NOW, WHEN YOU GOT YOUR ASSIGNMENT
28 TO COLLECT INFORMATION ON ALL WORK BEING DONE BY

1 OTHERS IN THIS FIELD, WHAT DID YOU DISCOVER WAS OUT
2 THERE IN TERMS OF OTHER WORK?

3 THIS IS SUMMER OF 1968.

4 A NOT MUCH.

5 Q WELL, JENSEN AND WIDMARK WERE OUT THERE,
6 RIGHT?

7 A YES.

8 THEY -- I'M NOT SURE EXACTLY WHEN THEY
9 ACTUALLY PUBLISHED IN THE LITERATURE, BUT WE HAD A
10 PRE-PUBLICATION FROM THEM.

11 Q AND THE FIRST NOTICE TO MONSANTO OF THEIR
12 WORK WAS IN NOVEMBER, DECEMBER, 1966, RIGHT?

13 A I GUESS IT WAS, YES.

14 Q OKAY. AND FROM THAT POINT FORWARD JENSEN
15 AND WIDMARK HAD CONTINUED TO DO RESEARCH, HADN'T
16 THEY?

17 A I GUESS THEY DID.

18 Q AND SO PART OF YOUR COLLECTING
19 INFORMATION ABOUT WHAT WAS GOING ON IN THE FIELD
20 ABOUT PCB'S YOU GOT ADDITIONAL INFORMATION ABOUT WHAT
21 JENSEN AND WIDMARK WERE FINDING, RIGHT?

22 A AS THEY PROVIDED US INFORMATION, WE GOT
23 IT, YES.

24 Q AND WHAT THEY WERE FINDING WAS THEY WERE
25 CONFIRMING THEIR EARLIER RESEARCH REPORTS, RIGHT?

26 A I ASSUME THAT IS TRUE.

27 Q YOU DON'T RECALL?

28 A NO.

1 I DON'T RECALL A CONTINUING STREAM OF
2 INFORMATION COMING OUT OF SWEDEN TO US.

3 BECAUSE I DON'T THINK THERE REALLY WAS.
4 AND THAT IS NOT THE WAY THAT THE EUROPEAN
5 FOLKS GENERALLY DID THINGS.

6 THEY DID A LOT OF THINGS AND THEN WHEN
7 THEY WERE SURE IT WAS RIGHT, THEY WOULD FINALLY
8 PUBLISH IT.

9 Q YOU ALSO DON'T RECALL CALLING JENSEN UP
10 AND YOU ASKING HIM WHAT RESEARCH?

11 A NO, I KNOW I DIDN'T CALL HIM UP.

12 Q IN ADDITION TO JENSEN AND WIDMARK, THE
13 FISH AND WILDLIFE SERVICES WERE DOING RESEARCH ON
14 PCB'S IN THE SUMMER OF 1968, WEREN'T THEY?

15 A YES.

16 Q AND THEY HAD CONTACTED MONSANTO, HADN'T
17 THEY?

18 A THAT'S CORRECT.

19 Q AND WAS THAT THE RESEARCH ON FINDING
20 PCB'S IN BALD EAGLES?

21 A WE WERE WORKING WITH PEOPLE AT PATUXENT
22 WHO WERE INVOLVED WITH THAT PARTICULAR PROGRAM. WE
23 SUPPLIED THEM WITH AND DISCUSSED METHODOLOGIES AND
24 THINGS OF THAT SORT.

25 Q IN ADDITION TO FISH AND WILDLIFE, THE
26 U.S. DEPARTMENT OF FISHERIES WAS DOING RESEARCH ON
27 PCB'S IN THE SUMMER OF 1968, CORRECT?

28 A AT GULF BREEZE AND MOUND LABORATORIES.

1 Q WEREN'T YOU FINDING PCB'S IN FISH IN LAKE
2 MICHIGAN?

3 A YES.

4 Q WERE THEY ALSO FINDING PCB'S -- WHERE IS
5 GULF BREEZE? FLORIDA, RIGHT?

6 A FLORIDA, RIGHT, PENSACOLA.

7 Q WERE THEY FINDING PCB'S IN FLORIDA?

8 A LET ME CLARIFY FINDING PCB'S.

9 AT THAT POINT IN TIME A LOT OF PEOPLE
10 WERE REVIEWING EARLIER WORK THAT WAS DONE FOR
11 PESTICIDES.

12 LOOKING AT THE RETENTION TIMES OF THE
13 PEAKS THEY SAW FOR THINGS THEY COULDN'T IDENTIFY AND
14 SAYING, "GEE, THOSE MUST BE PCB'S."

15 THERE WAS A LOT OF THAT GOING ON WHICH
16 WAS DEDUCTIVE LOGIC IN TERMS OF WHETHER OR NOT PCB'S
17 WERE PRESENT.

18 THERE WAS SOME WORK, NOT A LOT, GETTING
19 STARTED FOR ACTUALLY MEASURING PCB'S AND DEVELOPING
20 METHODOLOGIES FOR MEASURING PCB'S IN THESE.

21 SO THERE WERE BOTH THINGS GOING ON.

22 Q WHEN YOU SAY "MEASURING PCB'S," YOU KNOW
23 YOU'VE GOT PCB BUT YOU DON'T KNOW HOW MUCH YOU HAVE?

24 A WHAT I MEAN IS I HAVE DECIDED I WANTED TO
25 MEASURE PCB'S IN SOMETHING AND I HAVE THE METHODOLOGY
26 AND I KNOW IT WORKS SO I GO OUT AND COLLECT A SAMPLE
27 OR HAVE ONE COLLECTED AND I INTENTIONALLY MEASURE
28 THAT FOR PCB'S, NOT MEASURE IT FOR SOMETHING ELSE AND

1 SAY OH, YEAH, THAT IS WHAT THAT OTHER STUFF MIGHT
2 HAVE BEEN.

3 THERE IS NOTHING WRONG WITH DEDUCTIVE
4 LOGIC, IT'S JUST NOT ABSOLUTE AND IT NEEDS TO BE
5 CONFIRMED.

6 WHAT I'M TRYING TO SAY IS ALL OF THESE
7 LABORATORIES WERE TRANSITIONING BETWEEN DOING
8 PESTICIDES AND PCB'S.

9 THERE WAS A LOT OF DEDUCTIVE LOGIC BEING
10 APPLIED TO CHROMATOGRAPHS BEING LINKED TO PESTICIDE.

11 THEN THEY WOULD SAY GEE WE HAVE PCB'S
12 MAYBE. THEN THEY WOULD VALIDATE THE PROCEDURES AND
13 HAVE TESTING ON THE PCB'S IN LABORATORY.

14 Q JENSEN AND WIDMARK CONFIRMED WHAT THEY
15 WERE SEEING WAS PCB'S POURING PCB'S INTO THE LKB-9000
16 AND MATCHING EXACTLY THEIR CHROMATOGRAMS BY WHAT THEY
17 WERE FINDING IN PINE NEEDLES AND IN EAGLE FEATHERS
18 AND IN INFANT HAIR, HADN'T THEY?

19 A JENSEN AND WIDMARK HAD TAKEN A SUBSET OF
20 THE SAMPLES. THEY HAD ANALYZED AND SUBJECTED THEM TO
21 THE MASS SPEC AND SHOWING THEY WERE SEEING OCTACHLOR
22 BIPHENYLS AND THOSE KIND OF THINGS IN THEM.

23 SO THEY HAD ESTABLISHED THE PRESENCE OF
24 SOME OF THOSE PEAKS THEY WERE SEEING THAT THEY
25 COULDN'T IDENTIFY IN THE ELECTRON CAPTURE AS BEING
26 PCB'S.

27 Q AND THEN THEY POURED A SAMPLE OF PCB'S
28 INTO THE LKB-9000, THE MACHINE THEY WERE USING, AND

1 FOUND THAT IT MATCHED EXACTLY WITH THE CHROMATOGRAMS
2 THAT WERE PRODUCED BY THEIR ENVIRONMENTAL SAMPLES,
3 RIGHT?

4 A NO.

5 Q OKAY. LET'S TAKE A LOOK AT EXHIBIT 36,
6 DR. TUCKER.

7 YOUR HONOR, THE PART OF THIS EXHIBIT I
8 WOULD LIKE TO SHOW DR. TUCKER IS A NOTICE DOCUMENT.

9 THE COURT: THAT MEANS, LADIES AND GENTLEMEN,
10 THAT, AGAIN, THIS DOCUMENT IS CONCERNED WITH WHAT
11 MONSANTO KNEW AND WHEN.

12 IT IS NOT ADMISSIBLE FOR THE TRUTH OF
13 WHAT IT SAYS.

14 Q DR. TUCKER, THE PART I WOULD LIKE YOU TO
15 LOOK AT IS THE SECOND PAGE OF LKB PRESS RELEASE, DOWN
16 AT THE BOTTOM?

17 A PAGE 2.

18 Q DOWN AT THE BOTTOM, THE PARAGRAPH THAT
19 STARTS, "ONCE THIS FACT HAD BEEN ESTABLISHED, AN
20 APPROACH TO INDUSTRY ELICITED THE ANSWER THAT PCB WAS
21 FAIRLY EXTENSIVELY USED AND WHEN A SAMPLE WAS
22 OBTAINED AND RUN THROUGH THE LKB COMBINED GAS
23 CHROMATOGRAPH MASS SPECTROMETER, IT WAS FOUND THAT
24 THE GAS CHROMATOGRAPH GAVE THE SAME RETENTION TIME
25 FOR BOTH THE EAGLE SAMPLE AND THE INDUSTRIAL
26 SAMPLE."

27 A I THINK THAT IS A MISQUOTE BY THE
28 MANUFACTURER, ACTUALLY.

1 Q YOU ARE NOT FAMILIAR WITH ANY RESEARCH
2 THAT JENSEN AND WIDMARK DID WHERE THEY TOOK SAMPLES
3 OF PCB'S AND COMPARED THEM TO THE PCB'S SHOWING UP ON
4 THE CHROMATOGRAPHS FROM EAGLE FEATHERS?

5 MR. PREUSS: I WOULD LIKE TO OBJECT ON THE
6 BASIS THAT THAT IS NOT A NOTICE PURPOSE.

7 THE QUESTION WAS ASKED.

8 THE COURT: THE --

9 MR. PREUSS: IT WAS OFFERED FOR THE TRUTH OF
10 THE MATTER.

11 THE COURT: THE QUESTIONING WAS GOING TO THE
12 SAMPLES DONE BY THIS WITNESS AND HIS FAMILIARITY WITH
13 THE EXTENT OF THE SAMPLES.

14 THE OBJECTION IS OVERRULED.

15 AGAIN, LADIES AND GENTLEMEN, THE TRUTH OF
16 THE STATEMENT IS NOT BEFORE YOU.

17 GO AHEAD, MS. GRADY.

18 Q BY MS. GRADY: ARE YOU FAMILIAR WITH ANY
19 RESEARCH THAT JENSEN AND WIDMARK DID WHERE THEY TOOK
20 AN INDUSTRIAL SAMPLE OF PCB'S AND THEY POURED IT INTO
21 THE GC MS MACHINE AND COMPARED IT TO THE
22 CHROMATOGRAMS THAT WERE PRINTING OUT FOR THE EAGLE
23 FEATHERS?

24 A NO. NOT IN ANY PEER REVIEW GROUP
25 PUBLICATIONS. I'M AWARE OF THIS, NOW, BUT CERTAINLY
26 NOT ANY JOURNAL PUBLICATIONS IN WHICH THEY DISCUSS
27 THAT.

28 Q DID YOU DISCUSS WITH ANYONE WHO HAD

1 TALKED, SINCE YOU DIDN'T YOURSELF, WITH JENSEN AND
2 WIDMARK, WHETHER THEY HAD DONE COMPARISONS BETWEEN
3 THEIR RESEARCH CHROMATOGRAPHS OF THE ENVIRONMENTAL
4 SAMPLES AND ACTUAL INDUSTRIAL SAMPLES OF PCB'S?

5 A NO, MA'AM, I DID NOT.

6 Q SO IN ADDITION TO THE WORK THAT YOU
7 BECAME FAMILIAR WITH IN THE SUMMER OF 1968 OF JENSEN
8 AND WIDMARK AND THE FISH AND WILDLIFE SERVICES AND
9 THE U.S. DEPARTMENT OF FISHERIES, SHELL IN ENGLAND,
10 WAS ALSO DOING RESEARCH PCB'S, RIGHT?

11 A YES.

12 Q AND YOU FAMILIARIZED YOURSELF WITH THAT
13 RESEARCH, RIGHT?

14 A YES.

15 Q THE OFFICE OF THE GOVERNMENT CHEMIST IN
16 ENGLAND WAS DOING RESEARCH ON PCB'S?

17 A THAT IS THE SAME ONE YOU JUST MENTIONED
18 IN LONDON, CORRECT?

19 Q THAT WAS HOLMES, SIMMONS AND TATTON,
20 RIGHT?

21 A WE ARE TALKING ABOUT ONE SET NOT TWO.
22 IT SOUNDED LIKE YOU HAD TWO FOLKS WORKING
23 THERE.

24 THERE WAS ONE SET OF RESEARCHERS IN
25 LONDON THAT WERE PUBLISHING ON PCB'S.

26 Q THAT WAS HOLMES, SIMMONS AND TATTON?

27 A YES, MA'AM.

28 Q WHAT ABOUT HOLDEN AT THE DEPARTMENT OF

1 FISH AND WILDLIFE? HE WAS PUBLISHING?

2 A HE COULD HAVE BEEN.

3 I THOUGHT HE WAS PART OF THAT GROUP.

4 Q DO YOU THINK YOU WERE PROBABLY FAMILIAR
5 IN THE SUMMER OF 1968 WITH THE WORK OF HOLDEN THAT
6 WAS BEING DONE ON PCB'S?

7 A YES.

8 Q AND THERE WAS WORK BEING DONE IN THE
9 NETHERLANDS BY PROFESSOR VAN GENDEREN, CORRECT?

10 A YES.

11 Q AND THAT WAS WORK BEING DONE AT THE MONK
12 WOODS EXPERIMENTAL STATION, CORRECT?

13 A YES.

14 Q AND THERE WAS WORK BEING DONE AT CORNELL
15 BY DR. PIKALL, P-I-K-A-L-L, RIGHT?

16 A WHAT YEAR?

17 Q THE SUMMER OF 1968.

18 A YES.

19 Q THERE WAS WORK BEING DONE AT THE SAN
20 DIEGO NATURAL HISTORY UNIVERSITY BY DR. KERVIN,
21 CORRECT?

22 A I WASN'T AWARE OF THAT.

23 Q HOW DID YOU GO ABOUT FIGURING OUT WHO WAS
24 DOING WORK ON PCB'S WHEN YOU GOT YOUR ASSIGNMENT TO
25 SURVEY THE FIELD?

26 A MOST OF THE INFORMATION WE HAD GOTTEN
27 WERE THROUGH MONSANTO'S CONTACTS WITH THE OUTSIDE
28 WORLD AS TO WHO WAS DOING WHAT.

1 PLUS A LOT OF THE FOLKS DOING THAT KIND
2 OF INFORMATION CAME TO US NATURALLY TO OBTAIN SAMPLES
3 AND TO OBTAIN INFORMATION.

4 Q DID YOU CONTACT DR. RISEBROUGH IN THE
5 SUMMER OF 1968?

6 A I HAVE HAD CONVERSATIONS WITH
7 DR. RISEBROUGH.

8 Q WAS THAT IN THE SUMMER OF 1968?

9 A I DON'T RECALL EXACTLY. IT COULD HAVE
10 BEEN.

11 Q YOU MENTIONED IN RESPONSE TO QUESTIONS BY
12 MR. PREUSS THAT THERE WAS SOME CONFUSION WITH THE
13 RESEARCH OF JENSEN AND WIDMARK ABOUT BIPHENOLS VERSUS
14 BIPHENYLS, CORRECT?

15 A YES, MA'AM.

16 Q YOU DIDN'T HAVE ANY OF THAT CONFUSION,
17 DID YOU?

18 A YES, I DID.

19 Q DID YOU EVER SEE ANYTHING THAT JENSEN AND
20 WIDMARK REPORTED A REPORT OF BIPHENOLS?

21 A NOT JENSEN AND WIDMARK.

22 Q NO, IT WAS RISING AND STRAND, MONSANTO'S
23 AGENT IN SWEDEN THAT HAD THE ONLY REFERENCE TO
24 BIPHENOLS, RIGHT?

25 A IF MY MEMORY SERVES ME CORRECTLY, I
26 BELIEVE THAT BIPHENOL CAME FROM A SWEDISH ARTICLE
27 AND/OR THE TRANSLATION OF IT.

28 AND THERE WAS SOME CONFUSION BECAUSE

1 BIPHENOLS ARE VERY DIFFERENT THAN PHENYLS, YL'S
2 VERSUS OL'S, SO THERE WAS SOME CONFUSION FOR A MONTH
3 OR TWO ON STRAIGHTENING UP WHAT EVERYBODY WAS TALKING
4 ABOUT.

5 Q A MONTH OR TWO AFTER JENSEN AND WIDMARK
6 FIRST RECORDED THEIR RESULTS, YOU WERE STILL AT THE
7 UNIVERSITY OF IOWA, WEREN'T YOU?

8 A THEY REPORTED THEIR RESULTS IN LATE '66.
9 IF I JOINED MONSANTO IN SEPTEMBER OF '67,
10 I WOULD SAY THAT IS PROBABLY CORRECT.

11 Q SO BY THE SUMMER OF 1968 OR SOMETIME IN
12 1968 WHEN YOU GOT YOUR ASSIGNMENT FROM DR. KELLER,
13 YOU WEREN'T CONFUSED ABOUT BIPHENOLS VERSUS
14 BIPHENYLS, WERE YOU?

15 A I THINK THERE WAS STILL CONFUSION WITH
16 SOME FOLKS.

17 I HAD NOT EVEN BEGUN TO LOOK AT THE
18 PROBLEM SO IT DIDN'T MATTER WHETHER I WAS CONFUSED OR
19 NOT.

20 MY JOB WAS TO PUT TOGETHER THE
21 INSTRUMENTS AND WHEREWITHAL TO DO THE MEASUREMENTS
22 FOR PCB'S.

23 Q YOU TOLD MR. PREUSS, I THINK, THAT IN
24 RESPONSE TO HIS QUESTIONS THAT AT THE TIME YOU GOT
25 YOUR ASSIGNMENT FROM DR. KELLER THAT THERE WAS ONLY
26 ONE SCIENTIFIC INSTITUTE THAT HAD RECORDED FINDING
27 PCB'S; IS THAT RIGHT?

28 A THAT'S CORRECT.

1 Q WHAT ABOUT HOLMES, SIMMONS AND TATTON?

2 A I WASN'T AWARE OF THOSE PUBLICATIONS AT
3 THAT POINT.

4 Q WELL, THAT CAME OUT IN OCTOBER, 1967,
5 RIGHT?

6 A SIMPLY BECAUSE A PUBLICATION CAME OUT ONE
7 DAY DOESN'T MEAN I SAW IT THE DAY IT CAME OUT.

8 I'M TRYING TO TELL YOU TRUTHFULLY WHERE I
9 WAS. SO --

10 Q SOMETIME AFTER YOU TOOK YOUR ASSIGNMENT
11 FROM DR. KELLER, THOUGH, YOU BECAME AWARE THAT IT
12 WASN'T JUST ONE SCIENTIFIC INSTITUTE THAT WAS
13 REPORTING FINDING PCB'S, IT WAS ALL OF THESE
14 INSTITUTES WE HAVE JUST LISTED, RIGHT?

15 A IN 1966 I THINK WE HAD LOOKED AT ROUGHLY
16 THREE PUBLICATIONS THAT HAD BEEN OBTAINED.

17 IN 1967 I THINK THERE WAS MANY WHERE WE
18 HAD PAPER IN HAND AS PERHAPS THREE TO SEVEN.

19 Q WELL, WE ARE NOW IN THE SUMMER OF 1968.

20 SO WE ARE '67, '68, A YEAR AND A HALF
21 AFTER JENSEN AND WIDMARK HAVE REPORTED THEIR RESULTS.

22 SO BY THAT TIME THERE WERE NUMEROUS
23 SCIENTIFIC INSTITUTES THAT HAD REPORTED THEY HAD
24 FOUND PCB'S, RIGHT?

25 A THERE WERE NAMES OF SCIENTIFIC INSTITUTES
26 REPORTING THE PRESENCE OF PCB'S IN THE SAMPLES THEY
27 WERE ANALYZING, YES.

28 Q WHAT TESTING HAD MONSANTO DONE OF

1 ENVIRONMENTAL SAMPLES FOR PCB'S PRIOR TO THE TIME YOU
2 GOT YOUR ASSIGNMENT FROM DR. KELLER?

3 A TO MY KNOWLEDGE, NONE.

4 Q SO WHEN YOU GOT YOUR ASSIGNMENT FROM
5 DR. KELLER YOU HADN'T WORKED ON A GAS CHROMATOGRAPH,
6 RIGHT?

7 A JUST IN CLASSES, NOT ACTUALLY IN
8 INDUSTRY.

9 THAT'S CORRECT.

10 Q YOU HADN'T WORKED ON A MASS SPECTROMETER?

11 A THAT'S CORRECT.

12 Q YOU HADN'T WORKED ON AN ELECTRON CAPTURE
13 DEVICE?

14 A THAT'S CORRECT.

15 Q SO YOU WENT OUT AND DID A LITERATURE
16 RESEARCH TO FIND OUT WHO WAS DOING WORK ON THOSE
17 MACHINES, CORRECT?

18 A THAT'S CORRECT.

19 Q AND FOUND OUT THAT BOTH DOW CHEMICAL AND
20 SHELL OIL COMPANY HAD BEEN USING THE COMBINATION OF A
21 GAS CHROMATOGRAPH, MASS SPECTROMETER SINCE 1959,
22 RIGHT?

23 A IT COULD HAVE BEEN.

24 I WOULD LIKE TO SAY, I'M NOT SURE HOW YOU
25 KNOW I ESTABLISHED THAT.

26 BECAUSE I DON'T HAVE THAT RECOLLECTION.

27 Q WELL, WHAT IS YOUR RECOLLECTION OF WHAT
28 YOUR LITERATURE SEARCH PRODUCED?

1 A I DON'T RECALL, DO YOU?

2 Q YOU DO RECALL THAT SHELL OIL COMPANY,
3 SINCE 1959, HAD REPORTED THAT THEY HAD SUCCESSFULLY
4 USED A GAS CHROMATOGRAPH AND A MASS SPECTROMETER,
5 TOGETHER, TO ANALYZE SAMPLES, RIGHT?

6 A I DON'T RECALL THAT SPECIFICALLY BUT I
7 DON'T DOUBT IT.

8 Q AND YOUR LITERATURE SEARCH DISCLOSED TO
9 YOU THAT BECKMAN INSTRUMENTS BACK IN 1957 HAD
10 SUCCESSFULLY COMBINED A GAS CHROMATOGRAPH AND A MASS
11 SPECTROMETER AND USED IT TO ANALYZE SAMPLES, RIGHT?

12 A I DON'T RECALL THAT.

13 Q YOUR LITERATURE SEARCH DISCLOSED TO YOU
14 THAT THE ELECTRON CAPTURE DEVICE WHICH WAS THE FIRST
15 MACHINE THAT YOU USED IN YOUR ASSIGNMENT WITH
16 DR. KELLER WAS DEVELOPED IN 1958, RIGHT?

17 A '58 AND '59.

18 THAT'S CORRECT.

19 Q AND THAT COMMERCIAL GAS CHROMATOGRAPH
20 ELECTRON CAPTURE DEVICES I THINK WAS NUMBER ONE ON
21 THE LIST OF INSTRUMENTS YOU MADE FOR MR. PREUSS, HAD
22 BEEN AVAILABLE SINCE 1965, RIGHT?

23 A THAT'S CORRECT.

24 Q SO WHEN YOU SAID THAT ONLY JENSEN AND
25 WIDMARK WERE USING A GAS CHROMATOGRAPH WITH A MASS
26 SPECTROMETER, THAT WASN'T ACCURATE, WAS IT?

27 A I THINK IF YOU USED THE COMPLETE
28 STATEMENT I MADE, IT WAS VERY ACCURATE.

1 THEY WERE THE ONLY INDIVIDUALS USING THAT
2 COMBINATION TO ANALYZE ENVIRONMENTAL SAMPLES AND TO
3 DETERMINE WHAT THE INTERFERENCES WERE TO THE
4 PESTICIDE ANALYSIS THAT THEY WERE DOING.

5 I DON'T DOUBT THAT A NUMBER OF PEOPLE'S
6 USED A GC CONNECTED TO A MASS SPECTROMETER FOR THE
7 PROCEDURES.

8 THEY CONTINUE TO BE USED TODAY FOR A
9 NUMBER OF OTHER THINGS BESIDES PCB ANALYSIS.

10 THE POINT IS JENSEN AND WIDMARK WERE THE
11 FIRST IN USING THAT PARTICULAR TECHNIQUE TO CONFIRM
12 THE PRESENCE OF PCB'S IN SAMPLES THAT THEY WERE
13 ANALYZING FOR PESTICIDES.

14 I THINK THERE IS NO QUESTION ABOUT THEM
15 BEING THE FIRST TO DO THAT.

16 Q SO WOULD IT BE ACCURATE TO SAY THAT THE
17 EQUIPMENT WAS AVAILABLE AND THE EQUIPMENT HAD BEEN
18 HOOKED UP IN THIS WAY THAT JENSEN AND WIDMARK HOOKED
19 IT UP TEN YEARS PRIOR TO WHEN THEY DID IT, 12 YEARS
20 PRIOR TO WHEN THEY DID IT?

21 THEY WERE THE FIRST ONE TO STICK SOME
22 ENVIRONMENTAL SAMPLES AND LOOK FOR PCB'S?

23 A I HEARD 1959, WHICH IS SEVEN YEARS PRIOR
24 TO JENSEN AND WIDMARK.

25 I ALSO HAPPEN TO KNOW THAT LKB, THAT WAS
26 PROBABLY ONE OF THE VERY FIRST TIMES THEY HAD
27 INTERFACED A GC WITH A MASS SPEC.

28 SO IT WASN'T VERY COMMON.

1 Q OKAY. BUT JENSEN AND WIDMARK WEREN'T THE
2 FIRST PEOPLE TO USE THIS MACHINE, RIGHT?

3 A TO USE A MASS SPECTROMETER?

4 Q LOOKED UP TO A GAS CHROMATOGRAPH?

5 A NO, PROBABLY NOT.

6 Q AND AN ADDITIONAL PART OF THE ASSIGNMENT
7 YOU GOT FROM DR. KELLER INVOLVED TOXICOLOGY TESTS,
8 RIGHT?

9 A YES.

10 Q YOU WERE SUPPOSED TO WORK ON A PROJECT TO
11 START AN OUTSIDE TEST PROGRAM, IS THAT RIGHT?

12 A CORRECT.

13 Q DID THAT PROGRAM START IN AUGUST, 1968?

14 A IT DEPENDS ON WHAT YOU MEAN BY
15 "STARTED."

16 I DON'T KNOW EXACTLY WHEN IT DID START,
17 BUT I KNOW WHAT IT WAS.

18 Q WHEN DID THEY FIRST START THE FEEDING OF
19 PCB'S TO TEST ANIMALS?

20 A I THINK THAT WAS AROUND -- TOWARD THE END
21 OF 1968, IN THAT REGION.

22 Q OKAY. AND WERE YOU RESPONSIBLE FOR
23 OVERSEEING, IN PART, THE TOXICOLOGICAL TESTS BEING
24 DONE ON PCB'S?

25 A ABSOLUTELY NOT.

26 Q WHAT IS THIS A REFERENCE TO?

27 A IT'S A REFERENCE TO WHAT WE DID WAS WITH
28 THE TOXICOLOGY STUDY YOU HAD TO STUDY IT UNDER

1 TOXICOLOGY PEOPLE, PEOPLE WHO UNDERSTAND TOXICOLOGY.
2 WE INCLUDED ENOUGH X-RAY ANIMALS TO GENERATE SAMPLES
3 THAT WE COULD ANALYZE FOR PCB'S.

4 THAT HAD NOTHING REALLY TO DO WITH THE
5 TOXICOLOGY.

6 WHAT IT HAD TO DO WAS DETERMINING THE
7 AMOUNT OF DISTRIBUTION OF PCB'S IN ANIMALS DOSED WITH
8 IT.

9 Q SO YOU WERE GOING TO USE SAMPLES FROM THE
10 TISSUES OF THESE TOXICOLOGICAL EXPERIMENTS TO USE TO
11 TEST THROUGH YOUR PCB MACHINE; IS THAT RIGHT?

12 A YES. AND IN ADDITION TO THAT WE WERE
13 GOING TO USE THEM TO SEE EXACTLY WHAT HAPPENED TO
14 PCB'S WHEN THEY WENT INTO A BIOLOGICAL SYSTEM.

15 Q NOW, HOLMES, SIMMONS AND TATTON HAD
16 ALREADY REPORTED THAT WHERE PCB'S WENT WAS INTO THE
17 LIVERS OF BIRDS, RIGHT?

18 A NO.

19 I THINK ACTUALLY WHAT THEY REPORTED WAS
20 THAT THESE WERE LIPID SOLUBLE MATERIALS AND THE MOST
21 OF THE TIME THEY CONCENTRATED IN THE ADIPOSE TISSUE
22 OR WHAT IS COMMONLY KNOWN AS FAT.

23 Q SO WHAT THEY HAD FOUND, YOU ARE SAYING,
24 IS THAT PCB'S ACCUMULATED IN THE FAT OF BIRDS AND
25 ANIMALS?

26 A IN FAT IN GENERAL, YES, CORRECT.

27 Q AND BY THIS POINT IN TIME HADN'T OTHER
28 RESEARCHERS ALSO REPORTED FINDING A HIGH

1 CONCENTRATION, 800 PARTS PER MILLION PCB'S IN FAT ON
2 SEALS AND PORPOISES?

3 A THEY WERE REPORTING A HIGH CONCENTRATION
4 OF PCB'S IN LIPID TISSUE OF ANIMALS, YES.

5 Q NOW, WHEN YOU FIRST GOT YOUR ASSIGNMENT
6 FROM DR. KELLER, 20 PEOPLE WEREN'T WORKING ON THAT
7 ASSIGNMENT, WERE THEY?

8 A THAT'S CORRECT. THEY SURE WERE NOT.

9 Q THIS DOCUMENT SHOWS THAT IT WAS YOU AND
10 DR. KELLER SPLITTING 1.1 MAN YEAR.

11 IS THAT WHAT YOU REMEMBER IN THE SUMMER
12 OF 1968?

13 A THAT WOULD BE ABOUT RIGHT.

14 ABOUT THAT TIME I HAD AT LEAST TWO
15 TECHNICIANS WORKING FOR ME.

16 AND WHILE THEY WEREN'T TOTALLY DEDICATED
17 TO THE PROJECT BECAUSE WE HADN'T BROUGHT THINGS TO
18 THE POINT WHERE WE NEEDED THEM FULL-TIME, THEY WERE
19 ALSO INVOLVED.

20 Q IN THE SUMMER OF 1968 WERE YOU SPENDING
21 ALL OF YOUR TIME ON THE PCB PROJECT?

22 A PRETTY CLOSE TO ALL MY TIME.

23 Q AND SO YOU WERE THE ONE AND DR. KELLER
24 WAS THE POINT ONE?

25 A DR. KELLER WAS MY BOSS.

26 DR. KELLER WAS THE MANAGER OF A SECTION
27 THAT HAD A NUMBER OF GROUPS OF ANALYTICAL CHEMISTS IN
28 IT.

1 I WORKED AT THE BENCH LEVEL AND DID THE
2 ANALYSIS AND THINGS OF THAT SORT.

3 DR. KELLER OVERSAW US ALL.

4 Q BUT IN REFERENCE TO THIS 1.1 MAN YEARS,
5 YOU WERE SPENDING ALL OF YOUR TIME ON THE PROJECT BY
6 THE SUMMER OF 1968?

7 A I WOULD SAY KELLER WOULD BE AN
8 ADMINISTRATIVE VIEWPOINT WHERE HE WOULD BE PUTTING IN
9 A TENTH OF A MAN YEAR AND I WOULD PUT IN ALMOST A
10 FULL MAN YEAR.

11 40 HOURS A WEEK IS NOT WHAT WE WORKED.

12 I MEAN, YOU KNOW, IN THIS KIND OF
13 BUSINESS, A PROFESSIONAL MANNER, SOMETIMES SEVEN DAYS
14 A WEEK, 10 HOURS A DAY WE WOULD PUT IN. WE LIKED TO
15 WORK.

16 Q AND THEN THE OTHER COMMITMENT, AT LEAST
17 IN THE SUMMER OF 1968 WAS .1 MAN YEARS OF
18 DR. RICHARD'S TIME AND .3 MAN YEARS OF ELMER WHEELER
19 OR PAUL HODGES' TIME, RIGHT?

20 A CORRECT, THAT IS WHAT THE DOCUMENT
21 STATES.

22 Q SO AS OF THE SUMMER OF 1968, AS FAR AS
23 THESE TASKS UP HERE, ASSESSING THE VALIDITY OF THE
24 RESEARCH, CHECKING ALL OF THE INFORMATION THAT HAD
25 BEEN DONE ON PCB'S UP TO THAT POINT IN TIME, AND
26 STARTING THE TOXICOLOGICAL WORK, MONSANTO WAS
27 COMMITTING 1.5 MAN YEARS, CORRECT?

28 A IN ACCORDANCE WITH THAT DOCUMENT, YES.

1 Q OKAY. DO YOU KNOW WHAT THIS MEANS DOWN
2 HERE, "SPONSOR"?

3 A I DON'T HAVE A RECOLLECTION AS TO WHAT
4 THAT MEANS.

5 Q NOW, WHEN YOU GOT YOUR ASSIGNMENT TO
6 ASSESS THE METHODOLOGIES FOR TESTING PCB'S YOU ONLY
7 GOT ONE OF THE OTHER MONSANTO SCIENTISTS WHO WERE
8 DOING GAS CHROMATOGRAPHIC WORK TO TEACH YOU HOW TO
9 USE THAT MACHINE, RIGHT?

10 A I WENT OVER TO DR. ED EMORY WHO WAS THE
11 HEAD OF OUR GAS CHROMATOGRAPHY GROUP AND I SPENT A
12 FAIR AMOUNT OF TIME DISCUSSING WHAT WE SHOULD DO AND
13 HOW WE SHOULD DO IT. SO THAT'S RIGHT.

14 Q AND YOU DISCOVERED IN SEARCHING AROUND
15 MONSANTO FOR THE APPROPRIATE EQUIPMENT THAT MONSANTO
16 ALREADY HAD AN ELECTRON CAPTURE DEVICE; IS THAT
17 RIGHT?

18 A THEY HAD AN ELECTRON CAPTURE DETECTOR
19 THAT WASN'T CURRENTLY HOOKED UP TO AN INSTRUMENT OR
20 IN USE.

21 Q SO YOU HOOKED IT UP TO THE GAS
22 CHROMATOGRAPH.

23 WHAT DID YOU DO THEN?

24 A WELL, ACTUALLY ED EMORY, MYSELF AND
25 ANOTHER INDIVIDUAL, ONE OF HIS TECHNICIANS, HOOKED IT
26 UP TO A GAS CHROMATOGRAPH AND GOT IT GOING.

27 WHAT DID I DO NEXT AFTER I GOT IT GOING?

28 Q DID YOU RUN SAMPLES THROUGH IT?

1 A CERTAINLY NOT.

2 WE RAN STANDARDS THROUGH IT, KNOWN
3 THROUGH IT, BUT WE DIDN'T RUN SAMPLES THROUGH IT. WE
4 WEREN'T PREPARED TO RUN SAMPLES THROUGH IT AT THAT
5 TIME.

6 Q WAS PART OF YOUR JOB FOR DR. KELLER TO
7 DETERMINE WHAT ADDITIONAL EQUIPMENT HAD TO BE
8 PURCHASED?

9 A YES.

10 Q AND HOW DID YOU GO ABOUT DOING THAT,
11 DR. TUCKER?

12 A I WENT OVER WHAT TECHNIQUES PEOPLE HAD
13 USED AND WHAT I THOUGHT SHOULD BE DONE AND WHAT I
14 WOULD NEED TO DO.

15 I MADE A LIST OF THAT, PRESENTED IT TO
16 DR. KELLER.

17 WE GOT DOLLARS AND HOW MUCH IT WOULD COST
18 AND DELIVERIES AND WE DECIDED WHAT WE NEEDED TO DO.

19 HE WENT WHEREVER HE WENT TO GET
20 PERMISSION TO GET THOSE KINDS OF THINGS.

21 ULTIMATELY WE GOT THEM.

22 Q YOU WERE THE POINT PERSON FOR DETERMINING
23 WHAT ADDITIONAL EQUIPMENT MONSANTO NEEDED TO BUY,
24 RIGHT?

25 A I WAS THE INITIAL PERSON WHO SUGGESTED
26 WHAT WE NEEDED.

27 THAT'S THE POINT PERSON, YES.

28 Q AND THERE WAS SOME SORT OF BUDGETARY

1 PROCESS YOU HAD TO GO THROUGH WITH MONSANTO TO BUY
2 THE EQUIPMENT?

3 A ABSOLUTELY, YES.

4 Q YOU WROTE UP THE BUDGET REQUEST FOR THE
5 NEW EQUIPMENT, RIGHT?

6 A I WROTE UP, YOU KNOW, WHEN YOU GO TO THE
7 STORE AND BY SOMETHING, YOU WRITE UP A SHOPPING LIST
8 AND PUT THE ESTIMATED PRICES OVER.

9 YOU ADD IT UP AND YOU SAY, "HERE IS WHAT
10 WE NEED. THIS IS ABOUT HOW MUCH IT WILL COST."

11 Q AND WHAT YOU WANTED WAS A BIO-MEDICAL GAS
12 CHROMATOGRAPH, AN ALL GLASS SYSTEM, RIGHT?

13 A YES, MA'AM.

14 Q AND HOW MUCH DID THAT COST?

15 A YOU KNOW, I DON'T REALLY RECALL THE EXACT
16 NUMBER, BUT I WOULD GUESS SOMEWHERE IN THE RANGE OF
17 20 TO 40,000, SOMETHING LIKE THAT.

18 Q AND WHEN DID YOU PURCHASE THAT GAS
19 CHROMATOGRAPH WITH ELECTRON CAPTURE DEVICE?

20 A DURING THAT PERIOD OF TIME.

21 Q WHAT PERIOD OF TIME?

22 A THE PERIOD OF TIME YOU ARE TALKING ABOUT,
23 PROBABLY IN 19 -- SOMETIME IN 1968.

24 Q CAN YOU BE ANY MORE SPECIFIC?

25 A NO, I CAN'T.

26 THAT WAS 25 YEARS AGO.

27 Q IT'S A LONG TIME AGO AND I APPRECIATE YOU
28 GIVING US YOUR BEST RECOLLECTION.

1 IT WAS IN THE FALL, WASN'T IT?

2 A I JUST STATED I COULDN'T RECOLLECT.

3 IF YOU HAVE BETTER INFORMATION, I'M
4 WILLING TO ACCEPT IT.

5 Q OKAY. LET ME SHOW YOU A DOCUMENT WHICH
6 WE HAVE MARKED AS EXHIBIT 391.

7 I WILL ASK YOU TO TAKE A LOOK AT THAT
8 DOCUMENT, DOCTOR.

9 DID YOU WRITE EXHIBIT 391?

10 A I PROBABLY HELPED BOB KELLER WRITE IT.

11 Q SO YOU THINK YOU PLAYED A HAND IN WRITING
12 THIS?

13 A I PROBABLY PROVIDED KELLER WITH THE
14 INFORMATION TO WRITE THIS.

15 AT LEAST I GUESS I MIGHT HAVE.

16 Q THIS DOCUMENT SAYS THE MACHINE YOU
17 PURCHASED COST \$7,000?

18 A YES. IT SAYS, "THE BASIC INSTRUMENT COST
19 \$7,000."

20 IT DOESN'T SAY ANYTHING ABOUT THE
21 EQUIPMENT AND ALL OF THE OTHER THINGS NEEDED TO BE
22 PREPARED TO PREPARE SAMPLES AND GET IT READY TO
23 INTRODUCE INTO THE MACHINE.

24 THE BASIC EQUIPMENT AT THAT TIME, THIS IS
25 CORRECT, WAS ABOUT 7,000.

26 Q SO WHEN YOU GAVE AN ESTIMATE OF \$40,000,
27 YOU WERE REFERRING TO SOMETHING OTHER THAN A GAS
28 CHROMATOGRAPH WITH ELECTRON CAPTURE DEVICE, RIGHT?

1 A INSTRUMENTS NOWADAYS COST IN THE ORDER OF
2 40,000 SO I JUST ASSUMED IT WAS LIKE 20,000.

3 SO IF IT WAS 7,000, THAT'S FINE.

4 Q OKAY. THIS DOCUMENT IS DATED 8-28-68.

5 SO YOU DIDN'T PURCHASE THE ELECTRON
6 CAPTURE -- THE GAS CHROMATOGRAPH WITH ELECTRON
7 CAPTURE DEVICE AT THE BEGINNING OF 1968, DID YOU?

8 A I WOULD GUESS NOT, BY THIS INFORMATION
9 HERE.

10 Q AND IF YOU LOOK AT THE FIRST PAGE OF THIS
11 DOCUMENT, IT HAS SOME HANDWRITING ON IT.

12 DO YOU RECOGNIZE THAT HANDWRITING?

13 A NO, I DON'T RECOGNIZE IT.

14 Q OKAY. SO SOMETIME AFTER 8-28-68, THE
15 MACHINE THAT YOU USED TO TEST ENVIRONMENTAL SAMPLES
16 WAS PURCHASED, RIGHT?

17 A THE SECOND INSTRUMENT.

18 Q OKAY. AND MEANING YOU HAD THE ONE THAT
19 WAS -- THAT YOU DISCOVERED WHEN YOU SURVEYED WHAT
20 MONSANTO HAD IN-HOUSE, YOU FOUND A GAS CHROMATOGRAPH
21 AND YOU HOOKED UP AN ELECTRON CAPTURE DEVICE TO IT?

22 A THAT'S CORRECT.

23 Q BUT YOU NEVER USED THAT TO TEST
24 ENVIRONMENTAL SAMPLES?

25 A I DON'T THINK SO. WE USED IT FOR METHODS
26 DEVELOPMENT.

27 Q CAN YOU TAKE A LOOK AT THE SECOND PAGE OF
28 THIS.

1 A YES, MA'AM.

2 Q IT SAYS, "NEED FOR THE PROJECT.

3 "LATE IN 1966 SWEDISH RESEARCHERS
4 RECORDED THE PRESENCE OF POLYCHLORINATED BIPHENYLS IN
5 A VARIETY OF BIOLOGICAL SAMPLES. SINCE THAT TIME THE
6 ORGANIC CHEMICALS DIVISION HAS RECEIVED A NUMBER OF
7 REQUESTS FOR AROCLOR SAMPLES FROM ACTIVE PESTICIDE
8 RESEARCH GROUPS. WE ALSO KNOW THAT THE U.S. PUBLIC
9 HEALTH AUTHORITIES HAVE INDICATED STUDIES TO EVALUATE
10 THE SIGNIFICANCE OF THIS ENVIRONMENTAL
11 CONTAMINATION."

12 BY AUGUST OF 1968 THE U.S. PUBLIC HEALTH
13 AGENCIES WERE INVESTIGATING PCB'S IN THE ENVIRONMENT,
14 RIGHT?

15 A THEY HAD "INITIATED STUDIES" I BELIEVE
16 WAS THE WORD, CORRECT.

17 Q YOU NEEDED THIS MACHINE, YOU WROTE, "TO
18 ASSESS THE VALIDITY OF THESE FINDINGS, THE IMPACT
19 THEY MAY HAVE ON OUR AROCLOR BUSINESS AND TO AVOID
20 RESTRICTIVE LEGISLATION."

21 NOW, WE HAVE TALKED ASSESSING THE
22 VALIDITY OF THE FINDINGS.

23 WHY DID YOU NEED THE MACHINE TO ASSESS
24 THE IMPACT THAT THESE FINDINGS MAY HAVE ON MONSANTO'S
25 AROCLOR BUSINESS?

26 A WELL, THE REASON IS THAT THEY WERE
27 FINDING PCB'S AND AROCLORS WERE MADE UP OF PCB'S.

28 AND SO THERE MAY HAVE BEEN A CONNECTION

1 BETWEEN THE TWO.

2 AND IT WAS IMPORTANT THAT THAT CONNECTION
3 BE ESTABLISHED AS TO WHAT IT WAS, AND THAT THESE KIND
4 OF THINGS WERE NEEDED TO DO THAT.

5 Q AND THAT WAS BECAUSE AROCLORS WERE A
6 SUBSTANTIAL PERCENTAGE OF THE PRODUCT LINE OF
7 MONSANTO IN THE FALL OF 1968, RIGHT?

8 A AROCLORS -- YOU MEAN AROCLORS WERE A VERY
9 SIGNIFICANT PRODUCT TO MONSANTO?

10 Q MONSANTO SOLD A LOT OF AROCLORS.

11 A YES, MONSANTO WAS THE SOLE U.S.
12 MANUFACTURER OF AROCLORS.

13 Q SO IF THERE WAS A PROBLEM WITH AROCLORS,
14 THAT WAS A BIG PROBLEM FOR MONSANTO, RIGHT?

15 A IT WAS A PROBLEM FOR MONSANTO, YES.

16 Q WHAT IS "RESTRICTIVE LEGISLATION WILL BE
17 PASSED UP TO THIS POINT IN THE FALL OF 1968"?

18 A I THINK WHAT IT BASICALLY SAYS IS IT'S TO
19 AVOID RESTRICTIVE LEGISLATION.

20 THE BEST WAY I KNOW TO AVOID RESTRICTIVE
21 LEGISLATION IS TO HAVE THE PROPER INFORMATION
22 PROVIDED TO THE PEOPLE WHO ARE DOING THE LEGISLATION
23 SO THAT THEY CAN PREPARE LEGISLATION THAT IS PROPER.

24 BECAUSE IF THEY DON'T KNOW ANYTHING, THEY
25 HAVE A TENDENCY TO BE, YOU KNOW, VERY, VERY, VERY
26 ULTRA-RESTRICTIVE.

27 WHEREAS, IF THEY HAVE THE FACTS THEY CAN
28 MAKE LEGITIMATE DECISIONS RELATIVE TO WHAT NEEDS TO

1 BE DONE.

2 I THINK THAT IS BASICALLY WHAT IT MEANS.

3 Q SO YOUR CONCERN WAS THAT IF THERE WAS A
4 PROBLEM WITH PCB'S, YOU MIGHT BE LEGISLATED OUT OF
5 BUSINESS, CORRECT?

6 A THAT CERTAINLY WASN'T MY CONCERN.

7 THERE WERE CERTAINLY PEOPLE IN THE
8 BUSINESS THAT HAD THAT CONCERN. BUT MY JOB WAS TO
9 PROVIDE THE INFORMATION THAT WAS GOING ON AND TO
10 PROVIDE INFORMATION TO WHO WAS MAKING THE DECISIONS
11 RELATIVE TO WHAT WAS TO BE DONE IN THE FUTURE.

12 Q WHEN CONGRESS DID LEGISLATE CONCERNING
13 PCB'S, THEY LEGISLATED PCB'S OUT OF EXISTENCE, DIDN'T
14 THEY?

15 A NO, THEY DID NOT, IN A SENSE.

16 MONSANTO WITHDREW FROM THE MANUFACTURE OF
17 PCB'S PRIOR TO ANY LEGISLATION, THE TOXIC SUBSTANCES
18 ACT, THINGS OF THAT SORT.

19 I DON'T THINK THEY -- I DON'T UNDERSTAND
20 WHAT YOU ARE TRYING TO SAY HERE.

21 Q WELL, TSCA SAID, MADE IT ILLEGAL TO
22 MANUFACTURE AND SELL PCB'S, CORRECT?

23 A THEY DID, YES.

24 Q OKAY. SO IT'S SOME TIME NOW IN THE FALL
25 OF 1968. THE BUDGET REQUESTS WENT THROUGH FOR \$7,000
26 TO BUY THIS GAS CHROMATOGRAPH WITH AN ELECTRON
27 CAPTURE DEVICE HOOKED UP TO IT, RIGHT?

28 A TSCA, THE TSCA ACT DIDN'T OCCUR IN 1968.

1 THAT WAS MUCH LATER.

2 I DON'T WANT TO CONFUSE THAT ISSUE.

3 Q I THINK I SAID '78.

4 A OKAY, GOOD.

5 THANK YOU.

6 Q TSCA WAS PASSED IN '76, CORRECT?

7 A IN THAT RANGE, YES.

8 Q SO THE BUDGET REQUEST FOR \$7,000 WENT
9 THROUGH AND YOU BOUGHT THE GAS CHROMATOGRAPH WITH AN
10 ELECTRON CAPTURE DEVICE ACCOUNT, RIGHT?

11 A YES.

12 Q AND THIS WAS IN THE FALL OF '68?

13 A YES.

14 Q AND HOW LONG DID IT TAKE FOR YOU TO GET
15 IT?

16 A I WOULD GUESS A NORMAL DELIVERY WOULD BE
17 FOUR TO SIX WEEKS.

18 Q SO SOMETIME IN OCTOBER OF 1968 YOU GOT
19 THE GAS CHROMATOGRAPH WITH ELECTRON CAPTURE DEVICE?

20 A OKAY.

21 Q IS THAT RIGHT?

22 A IT'S OKAY, YES, FOUR TO SIX WEEKS LATER,
23 AFTER IT WAS ORDERED.

24 Q AND AFTER YOU RECEIVED IT YOU COULDN'T
25 START USING IT RIGHT AWAY BECAUSE YOU HAD TO, AS YOU
26 EXPLAINED IN YOUR QUESTIONING BY MR. PREUSS, YOU HAD
27 TO UNPACK IT AND SET IT UP AND CALIBRATE IT AND MAKE
28 SURE IT WAS WORKING PROPERLY, RIGHT?

1 A YES, MA'AM.

2 Q SO WHAT IS YOUR BEST ESTIMATE, NOW THAT
3 WE HAVE WORKED THROUGH THIS CHRONOLOGY, FOR WHEN YOU
4 STARTED PUTTING ENVIRONMENTAL SAMPLES INTO THE
5 MACHINE?

6 A MY GUESS WOULD BE SOMETIME IN LATE '68,
7 EARLY '69, IN THAT REGION.

8 Q OKAY. SO THE FIRST TIME THAT YOU KNOW OF
9 THAT MONSANTO DID ENVIRONMENTAL TESTS OF MATERIALS TO
10 DETERMINE WHETHER THEY HAD PCB'S IN THEM WAS IN LATE
11 1968, RIGHT?

12 A YES.

13 Q SO THAT IS TWO YEARS AFTER JENSEN AND
14 WIDMARK ANNOUNCED THEIR RESULTS AND MONSANTO LEARNED
15 OF THEM, RIGHT?

16 A YES.

17 Q LET'S LOOK AT ANOTHER DOCUMENT,
18 DR. TUCKER.

19 LET'S LOOK AT EXHIBIT 57.

20 IS THAT IN THE SAME BOOK?

21 A NO, MA'AM.

22 THIS GOES THROUGH 50.

23 LET ME GET IT.

24 57?

25 Q RIGHT.

26 THAT IS DATED OCTOBER 21, 1968?

27 A THAT'S CORRECT.

28 Q AND WHAT IT IS REPORTING ON IS

1 DR. RISEBROUGH'S RESEARCH CONCERNING FINDING PCB'S IN
2 BIRDS IN CALIFORNIA, RIGHT?

3 A IT'S -- IT DELINEATES THE PUBLICATION
4 OBTAINED FROM MR. SPENCER REGARDING INFORMATION THAT
5 RISEBROUGH WAS GENERATING ON THE SUBJECT.

6 Q RIGHT. AND WHAT IT SAYS IN THE LAST
7 PARAGRAPH THERE IS, IN A FEW WORDS, "RISEBROUGH HAS
8 FOUND PCB'S ALONG WITH CHLORINATED PESTICIDES IN A
9 NUMBER OF SPECIES OF FISH AND BIRDS ALONG THE
10 CALIFORNIA COAST AS WELL AS IN WATERS OFF OF BAJA
11 CALIFORNIA AND CENTRAL AMERICA. HE FURTHER REPORTS
12 PCB'S IN FISH FROM THE CHANNEL ISLANDS AND PUGET
13 SOUND. AND THEN IT SAYS PCB WAS DETECTED IN THE
14 LIVER OF TUNA TAKEN FROM THE GALAPAGOS ARCHIPELAGO.

15 "SCOTT TURNER WILL SCRUTINIZE THE
16 ANALYTICAL ASPECTS AND PARTICULARLY THE VALIDITY OF
17 SOME OF THE ASSUMPTIONS MADE BY THE AUTHOR."

18 A RIGHT. SCOTT TURNER IS SCOTT TUCKER
19 WHICH IS ME.

20 THIS IS THE PRESENTATION THAT HE GAVE AND
21 SAID THAT IT IS A PRIVILEGED SOURCE AND IF HE WENT
22 PUBLIC WITH THE SOURCE IT CAME FROM, THE SOURCE WOULD
23 REFUSE TO GIVE IT TO HIM IN THE FUTURE IF HE
24 DISCLOSED WHO HAD GIVEN IT TO HIM.

25 IT WAS A REAL UNDOCUMENTED TENTATIVE
26 THING, BUT, YES I WAS TO LOOK AT THAT AND TRY TO
27 ESTABLISH THE VALIDITY OF WHAT THE RESEARCH WAS DOING
28 IN REGARD TO REALITY. YES.

1 Q DID YOU GO OUT TO CALIFORNIA AND COLLECT
2 FISH SAMPLES AND BIRD SAMPLES TO RUN THEM THROUGH THE
3 MACHINE THAT YOU WERE SETTING UP?

4 A FOR PCB'S?

5 Q YES.

6 A NO, WE DID NOT.

7 Q DR. RISEBROUGH'S RESEARCH WAS PUBLISHED
8 IN DECEMBER OF 1968, RIGHT?

9 A YES.

10 Q AND DID YOU CALL UP DR. RISEBROUGH AND
11 HAVE A CONVERSATION WITH HIM ABOUT HIS TESTING
12 METHODOLOGIES?

13 A I DID NOT BUT PEOPLE IN OUR COMPANY DID
14 HAVE CONVERSATIONS WITH DR. RISEBROUGH AND
15 DR. RISEBROUGH NEVER CONFIRMED THE PRESENCE OF PCB'S
16 IN ANYTHING BY MASS SPECTROMETRY.

17 HE USED DEDUCTIVE LOGIC TO SAY PCB'S WERE
18 PRESENT IN THINGS.

19 Q MEANING THAT WHAT DR. RISEBROUGH DID WAS
20 HE RAN CHROMATOGRAPHS WHICH WERE THESE THINGS THAT I,
21 AT LEAST BEING FROM CALIFORNIA LOOK LIKE SEISMOGRAPH
22 CHARTS, HE RAN THOSE ON FISH AND BIRD SAMPLES FROM
23 CALIFORNIA AND OTHERS PLACES AND HE COMPARED THOSE TO
24 CHROMATOGRAPHS FROM MONSANTO PRODUCTS, RIGHT?

25 A WHICH WERE OBTAINED AT A LATER DATE AND
26 COMPARED TO INFORMATION GENERATED EARLIER.

27 SO HE DETERMINED DEDUCTIVELY THAT PCB'S
28 COULD BE PRESENT IN THE SAMPLES THAT HE WAS ANALYZING

1 FOR A DIFFERENT PURPOSE.

2 Q AND YOU INDICATED EARLIER, THERE IS
3 NOTHING WRONG WITH THAT, RIGHT?

4 A NO, AS LONG AS YOU STATE THAT IT'S NOT
5 ABSOLUTELY TRUE AND THAT IT'S DEDUCTIVE.

6 IN OTHER WORDS, YOU NEED TO DO MORE TO
7 MAKE SURE THAT IT'S RIGHT.

8 YOU ALSO HAVE TO SAY THAT IF YOU HAVE 100
9 FINDINGS OF THIS SORT, THAT, YOU KNOW, MAYBE COULD BE
10 CORRECT, MAYBE 90 ARE CORRECT.

11 YOU DON'T KNOW.

12 WHAT YOU REALLY NEED TO DO AT THAT POINT
13 IN TIME IS DO A LITTLE BIT MORE CAREFUL JOB OF REALLY
14 LOOKING FOR WHAT YOU ARE LOOKING FOR.

15 Q WELL, SAMPLES WERE PROVIDED TO
16 DR. RISEBROUGH OF MONSANTO AROCLORS, RIGHT?

17 A YES, WE DID. BECAUSE WE WERE CONCERNED
18 HE WOULD DO THAT KIND OF THING.

19 Q AND HE RAN CHROMATOGRAPHS, RIGHT, OR
20 PRODUCED CHROMATOGRAMS, IS THAT THE RIGHT WORD?

21 A I ASSUME HE DID.

22 AS YOU SAID, I DIDN'T HAVE CONVERSATIONS
23 DIRECTLY WITH RISEBROUGH UNTIL LATER.

24 Q HE COMPARED CHROMATOGRAMS FROM THE
25 MONSANTO SAMPLE TO THE CHROMATOGRAMS FROM THE FISH
26 AND BIRD SAMPLES FROM THE ENVIRONMENT AND SAW THEM AS
27 IDENTICAL, RIGHT?

28 A HE DEDUCED THEY WERE EQUAL TO SOME

1 DEGREE. THEY WEREN'T IDENTICAL.

2 THEY WERE SIMPLY NOT IDENTICAL.

3 Q BUT THEY SHOWED PCB'S PEAKS, RIGHT?

4 A THEY SHOWED PEAKS THAT COINCIDED WITH
5 SOME OF THE PCB'S PRESENT IN THE AROCLOR MATERIALS WE
6 PROVIDED THEM.

7 SO HE DEDUCED THAT THOSE WERE PCB'S.

8 THAT IS A LOGICAL DEDUCTION BUT IT'S FAR
9 FROM PROOF.

10 IT NEEDS TO BE CARRIED THAT ONE STEP
11 FURTHER WHICH OTHER RESEARCHERS DID.

12 Q LET HE LOOK AT THE NEXT EXHIBIT WHICH IS
13 EXHIBIT 61.

14 A YES, MA'AM.

15 Q I JUST WANT TO ASK YOU A FEW QUESTIONS
16 ABOUT THIS, DR. TUCKER.

17 A YES, MA'AM.

18 Q NOW, THIS WORK DESCRIBED IN THE FIRST
19 PARAGRAPH, DR. CALANDRA, HE WORKED FOR INDUSTRIAL
20 BIO-TEST, RIGHT?

21 A DR. CALANDRA WAS THE PRESIDENT OF
22 INDUSTRY BIO-TEST, RIGHT.

23 Q AND INDUSTRIAL BIO-TEST WAS THE OUTSIDE
24 LAB THAT MONSANTO HIRED TO DO TOXICOLOGICAL WORK ON
25 PCB'S, RIGHT?

26 A YES, THAT'S RIGHT.

27 Q THE TOXICOLOGICAL WORK WHERE PCB'S WERE
28 FED TO DOGS AND TO CHICKENS AND TO RATS AND OVER

1 VARYING PERIODS OF TIME AND THEN THE ANIMALS WERE
2 EXAMINED TO SEE IF THE PCB'S HAD AN EFFECT ON THEM,
3 RIGHT?

4 A CORRECT.

5 THEY WERE ALSO LOOKED AT FOR TOXICOLOGY
6 PROPERTIES WHICH IS WHAT THE REAL STUDY WAS ABOUT.

7 Q BUT FOR YOUR PURPOSES, I TAKE IT, WHAT
8 YOU WERE INTERESTED IN IS JUST GETTING TISSUE SAMPLES
9 THAT YOU COULD RUN THROUGH YOUR MACHINE TO VALIDATE
10 YOUR MACHINE?

11 A THAT IS CORRECT.

12 YOU HAD ASKED EARLIER WHAT MY INVOLVEMENT
13 WAS WITH TOXICOLOGY. I WAS CAREFUL TO TELL YOU I AM
14 NOT A TOXICOLOGIST.

15 MY INVOLVEMENT WAS TO MAKE SURE THERE
16 WERE ENOUGH ANIMALS INVOLVED IN THE STUDIES TO GIVE
17 US ENOUGH TISSUE SAMPLES TO PROVIDE PCB METHODOLOGY.

18 Q THIS SAYS THAT "DR. CALANDRA IS TO BEGIN
19 30-DAY RANGE FINDING TOXICITY STUDIES WITH RATS ON
20 EACH OF THE FOUR AROCLORS WHICH HAVE BEEN SENT TO
21 HIM."

22 NOW, BACK IN THAT BUDGET DOCUMENT WE
23 LOOKED AT EARLIER WHICH WAS EXHIBIT 768, THE TARGET
24 DATE FOR STARTING THE OUTSIDE TEST PROGRAM WAS AUGUST
25 15, 1968.

26 IS IT YOUR RECOLLECTION THAT THE OUTSIDE
27 TESTING DIDN'T START UNTIL DECEMBER, 1968?

28 A THAT WOULD BE MY RECOLLECTION WITH THIS

1 MEMO, YES.

2 Q OKAY. DOWN HERE AT THE BOTTOM, I GUESS
3 THERE WAS ANOTHER OUTSIDE RESEARCHER THAT WAS ALSO
4 DOING SOME TESTS; IS THAT RIGHT, FRED YOUNGER OF
5 YOUNGER LABS?

6 A YES.

7 Q AND IT SAYS THAT "FRED WAS TO PROVIDE US
8 SOME SPECIMENS FROM SOME RATS WHICH HE IS CURRENTLY
9 DOSING WITH ONE OF THE AROCLORS AND A LUBRICATING
10 OIL"?

11 A YES.

12 Q DO YOU KNOW WHAT LUBRICATING OIL THAT
13 WAS?

14 A USUALLY WHEN YOU DOSE ANIMALS, THEY CALL
15 IT GRANAGE, THEY PUT A TUBE DOWN THE THROAT AND FORCE
16 THE STUFF DOWN IN. IT'S USUALLY DISSOLVED IN MINERAL
17 OIL WHICH IS A LUBRICATING OIL.

18 THAT IS THE WAY THE ANIMALS WERE EXPOSED
19 TO IT. AT LEAST THEY USED TO BE. THAT WAS MANY
20 YEARS AGO.

21 Q YOU HAVE NO INFORMATION THAT THIS WAS A
22 MONSANTO LUBRICATING OIL?

23 A I DOUBT IF IT WAS.

24 IT WAS A PURE AROCLOR DISSOLVED IN
25 MINERAL OIL WHICH WAS A VEHICLE USED TO EXPOSE THE
26 ANIMAL TO AROCLOR SO WE COULD, AGAIN, GAIN SOME
27 TISSUE SAMPLES AND SEE IF WE COULD FIND THE AROCLORS.

28 Q LET ME ASK YOU ABOUT SOMETHING ON THE

1 SECOND PAGE, DR. TUCKER.

2 THERE IN PARAGRAPH 8?

3 A YES, MA'AM.

4 Q "THERE SHOULD BE FOLLOW-UP WITH THE FISH
5 AND WILDLIFE PEOPLE AT PATUXENT WITH THE REQUEST FOR
6 DUPLICATE SAMPLES OF SOME OF THE SAMPLES THEY HAVE
7 IDENTIFIED. SO THAT WE CAN ATTEMPT TO CONFIRM THEIR
8 RESULTS."

9 THAT IS THIS REFERENCE TO THE WORK THE
10 PATUXENT LABORATORY WAS DOING ON PCB'S IN BALD
11 EAGLES, WASN'T IT?

12 A YES.

13 Q AND DID THEY FIND PCB'S IN BALD EAGLES?

14 A I THINK THEY DID.

15 Q DID YOU CONFIRM THEIR RESULTS?

16 A NO, I DON'T THINK THEY EVER PROVIDED A
17 SAMPLE.

18 Q LET'S LOOK AT EXHIBIT 67, DR. TUCKER.
19 DO YOU HAVE THAT IN FRONT OF YOU?

20 A YES, MA'AM.

21 Q DO YOU RECOGNIZE EXHIBIT 67?

22 A YES, MA'AM.

23 Q WHAT IS IT?

24 A IT'S KIND OF LIKE A DIAGRAM PREPARED BY
25 DR. KELLER AND MYSELF THAT KIND OF SHOWED ALL THE
26 WORK BEING DONE RELATIVE TO PCB'S BY THE VARIOUS
27 OUTSIDE FIRMS AND THINGS OF THAT SORT THAT WE WERE
28 INVOLVED IN THE PROJECT.

1 Q WAS THIS AS OF THE BEGINNING OF 1969?

2 A YES, MA'AM, THE DATE ON THE CORNER IS
3 1-4-69 AND THE -- IT'S 1-15-69.

4 SO JANUARY, 15, 1969.

5 Q NOW, THIS SAYS THAT ONE OF THE TASKS WAS
6 TO -- DOWN THERE AT THE BOTTOM, DR. TUCKER, TO
7 DETERMINE ENVIRONMENTAL CONTAMINATION TO PROTECT
8 PRODUCT POSITION WITH THE CUSTOMER?

9 A WHICH ONE? ARE YOU ON NUMBER 4?

10 OKAY. YOU ARE ON NUMBER 4. ON THE
11 LEFT-HAND SIDE IT'S NUMBER 4.

12 Q YES. EXACTLY NUMBER 4.

13 WITH RESPECT TO AROCLOR 1242, 1254 AND
14 1260.

15 SO THE JUSTIFICATION FOR THE PROJECT WAS
16 TO DETERMINE ENVIRONMENTAL CONTAMINATION TO PROTECT
17 PRODUCT POSITION WITH THE CUSTOMER, DETERMINE AROCLOR
18 SOLUBILITY AND WATER PERCENT, WILDLIFE EXTRACTS.

19 THAT WAS THE WORK YOU WERE DOING, RIGHT?

20 A YES.

21 Q AND YOU HAD A NEW DEADLINE HERE OF
22 10-17-69; IS THAT RIGHT?

23 A THAT IS WHAT IT SAYS, YES.

24 Q NOW, WASN'T YOUR PREVIOUS DEADLINE 3-69?

25 A IT COULD HAVE BEEN, YES, MA'AM.

26 Q DO YOU RECALL THERE WAS SOME SLIPPAGE IN
27 GETTING THE ENVIRONMENTAL SAMPLES INTO THE MACHINE
28 AND TESTED AND VERIFIED?

1 A I RECALL THAT THERE WERE A MILLION THINGS
2 THAT PEOPLE WANTED DONE AND THAT WE WERE TRYING TO
3 BRING MORE AND MORE RESOURCES TO GET THOSE KIND OF
4 THINGS DONE.

5 SO IT WOULDN'T SURPRISE ME IF THERE WAS
6 SOME SLIPPAGE.

7 I WOULD ALSO POINT OUT THAT EVERYBODY'S
8 BOSSES, INCLUDING MINE, HAVE A WAY OF CHANGING
9 PRIORITIES OCCASIONALLY SO DUE DATES DO CHANGE.

10 I'M TAKING THIS PERSONALLY, I GUESS,
11 BECAUSE I WASN'T COMPLETING MY ASSIGNMENTS ON TIME.
12 I KNOW THAT IS NOT TRUE.

13 Q BUT YOUR BEST RECOLLECTION IS THAT EITHER
14 THROUGH A CHANGE OF PRIORITIES OR THROUGH YOU NEEDED
15 MORE PEOPLE THAT THE NEW DEADLINE FOR DETERMINING
16 ENVIRONMENTAL CONTAMINATION TO PROTECT PRODUCT
17 POSITION WITH CUSTOMER WAS OCTOBER, 1969, RIGHT?

18 A TO DETERMINE THIS SPECIFIC PORTION OF
19 IT.

20 I MEAN, THAT WAS KIND OF LIKE AN ONGOING
21 PROJECT.

22 Q THE PORTION THAT DEALT WITH AROCLOR 1242?

23 A 1254 AND 1260.

24 Q RIGHT.

25 A RIGHT.

26 Q SO YOUR BEST RECOLLECTION IS YOU NOW HAD
27 A DEADLINE OF OCTOBER, 1969?

28 A TO COMPLETE THIS PORTION OF IT, WHICH IS

1 SHOWN IN THE JOB OR PROJECT WHICH WAS BASICALLY TO
2 LOOK AT THREE TYPES OF TECHNIQUES THAT COULD BE USED
3 AND DEVELOP THE SENSITIVITY INFORMATION WE NEEDED IN
4 THOSE THREE NATURE SCENES, YES.

5 Q NOW, BY THE WAY, NOW THAT WE HAVE
6 ESTABLISHED THAT THE GAS CHROMATOGRAPH WITH ELECTRON
7 CAPTURE DEVICE WASN'T PURCHASED UNTIL SOMETIME IN THE
8 FALL OF 1968, DOES THAT REFRESH YOUR RECOLLECTION IN
9 ANY WAY ABOUT WHEN YOU GOT THE MASS SPECTROMETER YOU
10 HAD TO SETUP?

11 A I THOUGHT WE HAD ESTABLISHED THAT THE
12 MASS SPECTROMETER WAS PURCHASED OR ORDERED IN 1967
13 AND ARRIVED IN 1968.

14 I THINK WE ALSO ESTABLISHED THAT I DIDN'T
15 SET THAT MASS SPECTROMETER UP, THAT SOME OTHER PEOPLE
16 SET THE MASS SPECTROMETER UP.

17 Q YOU THINK IT WAS SET UP IN '68, THOUGH?

18 A I THINK THEY BEGAN SETTING IT UP THEN.

19 AT LEAST THAT WAS THE TIME FRAME.

20 THE COURT: MS. GRADY, WE WILL TAKE THE
21 AFTERNOON BREAK AT THIS POINT AND BE IN RECESS UNTIL
22 THREE O'CLOCK RESUMING AT THAT TIME

23 (RECESS.)

24 THE COURT: AND RESUMING.

25 GO AHEAD, MS. GRADY.

26 MS. GRADY: THANK YOU, YOUR HONOR.

27 Q DR. TUCKER, REFERRING BACK TO EXHIBIT 67,
28 THIS IS, IF YOU FLIP THE PAGE FROM WHERE YOU WERE,

1 THIS IS A DOCUMENT YOU WROTE, RIGHT, THAT STATED,
2 "1-15-69, REK/ST"?

3 A THIS IS A DOCUMENT MY BOSS AND I WROTE
4 WHICH MEANS I CONTRIBUTED TO IT AND HE PUBLISHED IT.

5 Q OKAY. I WANT TO TURN BACK TO THAT
6 PREVIOUS PAGE WE WERE ON.

7 A THE FRONT PAGE OR THE SECOND PAGE?

8 Q THE SECOND PAGE.

9 A YES, MA'AM.

10 Q WHERE IT SAYS, NEXT TO ITEM NUMBER 4,
11 "AROCLORE 1242, 1254, 1260."

12 THEN IT HAS THE PROJECT WHICH IS TO
13 DEVELOP THESE ANALYTICAL TECHNIQUES AND THEN IT HAS
14 THE JUSTIFICATION.

15 WHAT IT SAYS UNDER JUSTIFICATION IS
16 "DETERMINE ENVIRONMENTAL CONTAMINATION TO PROTECT
17 PRODUCT POSITION WITH THE CUSTOMER."

18 DO YOU SEE THAT?

19 A YES, MA'AM, I DO.

20 Q NOW, DR. TUCKER, WAS IT YOUR JOB TO
21 DETERMINE THE SCIENTIFIC TRUTH CONCERNING PCB'S OR
22 WAS IT YOUR JOB TO HELP OUT THE BUSINESSMEN WHO WERE
23 SELLING PCB'S?

24 A I THINK THERE IS NO QUESTION ABOUT WHAT
25 MY JOB WAS.

26 MY JOB WAS TO FIND OUT SCIENTIFICALLY
27 WHAT WAS HAPPENING.

28 WE DON'T CALL THAT THE TRUTH. WE JUST

1 CALL THAT WHAT IS HAPPENING.

2 SO I -- THE TRUTH IS A -- MY JOB WAS TO
3 FIND OUT SCIENTIFICALLY WHAT WAS HAPPENING AND TO BE
4 ABLE TO DEFEND THAT POSITION AND SUPPORT IT WITH THE
5 APPROPRIATE KIND OF QUALITY INFORMATION AND PROVIDE
6 IT TO THE PEOPLE WHO WOULD MAKE THE DECISIONS,
7 ULTIMATELY, WHETHER WHAT WOULD AND WOULDN'T BE DONE.

8 Q SO THEY COULD PROTECT THE PRODUCT
9 POSITION WITH THE CUSTOMER, RIGHT?

10 A YES, SO THAT THEY COULD INFORM THE
11 CUSTOMER OF TRULY WHAT WAS GOING ON AND MAKE SOUND
12 DECISIONS RELATIVE TO WHAT THEY NEEDED TO DO, BASED
13 ON THE INFORMATION THAT THEY WERE GIVEN, YES.

14 Q YOU NEVER TALKED TO TRANSWESTERN, DID
15 YOU?

16 A NO, MA'AM.

17 Q YOU NEVER TALKED TO TEXAS EASTERN?

18 A NO, MA'AM.

19 Q SO AS FAR AS ANY INFORMATION PROVIDED TO
20 THOSE TWO CUSTOMERS, YOU DON'T HAVE ANY PERSONAL
21 KNOWLEDGE, RIGHT?

22 A NO, MA'AM, I DID NOT PROVIDE ANY
23 INFORMATION TO THOSE PEOPLE DIRECTLY OR TO MY
24 KNOWLEDGE.

25 Q NOW, THE FIRST ENVIRONMENTAL SAMPLES YOU
26 RAN THROUGH THAT MACHINE WERE ANALYZED IN FEBRUARY,
27 1969, RIGHT?

28 A THAT'S FINE.

1 I THINK WE HAVE SORT OF ESTABLISHED THAT
2 EARLIER; IS THAT CORRECT?

3 Q WELL, I WILL SHOW YOU A DOCUMENT.

4 AND THAT IS EXHIBIT 71.

5 A OKAY.

6 Q DO YOU HAVE THAT?

7 A FEBRUARY 25TH, 1969.

8 Q AND THESE WERE THE FIRST TEST RESULTS AND
9 THEY WERE OF WATER AND SEDIMENT SAMPLES IN THE
10 ENVIRONMENT, RIGHT?

11 A RIGHT.

12 THEY WERE TAKEN AT THE PLANT OUTFLOW.

13 Q AND THIS IS IN THE ENVIRONMENT, RIGHT?

14 A THAT IS THE INTERFACE BETWEEN THE PLANT
15 AND THE ENVIRONMENT, THAT'S CORRECT, YES, MA'AM.

16 Q THAT IS IN THE ENVIRONMENT, RIGHT?

17 A AS WE STATED EARLIER, THE FIRST THING WE
18 DID WAS LOOK IN AREAS WE THOUGHT WHERE WE WOULD FIND
19 THE MATERIALS SO WE WENT CLOSEST TO THE SOURCE OF
20 MATERIALS.

21 THE CLOSEST TO US.

22 THAT HAPPENED TO BE THIS PLANT, YES,
23 MA'AM.

24 Q AND WHAT YOU FOUND IN THE ENVIRONMENT WAS
25 PCB'S?

26 A CORRECT.

27 Q AROCLOR 1242, TO BE EXACT, RIGHT?

28 A YES.

1 THE AMOUNT OF AROCLOR FOUND WAS
2 CALCULATED AS AROCLOR 1242.

3 AND THE TRACES OF THE SEDIMENT WERE
4 UNMISTAKENLY 1242.

5 SO IT WAS UNALTERED AROCLOR PRODUCT AT
6 THE OUTFLOW OF THE PLANT.

7 Q IN THE SEDIMENT, IN THE MUD?

8 A YES, MA'AM, AND THE WATER, TOO.

9 I JUST NOTICED HERE THAT WE ALSO ANALYZED
10 THE WATER.

11 Q THERE WERE ALSO WATER TESTS?

12 A YES, MA'AM.

13 Q NOW, DOWN IN THIS MEMO -- YOU WROTE THIS
14 MEMO, RIGHT, DR. TUCKER?

15 A YES, MA'AM, I DID.

16 Q DOWN IN THAT THIRD PARAGRAPH, YOU STATE,
17 "BILL TO GIVE US INFORMATION I THINK THAT IF THE PCB
18 ACCUSATION TURNS OUT TO BE TRUE AND THE GOVERNMENT
19 PEOPLE BECOME MORE ACTIVE, WE SHOULD PLAN ON AN
20 EXTENSIVE EVALUATION OF THE EXTENT OF CONTAMINATION
21 IN THIS AREA."

22 MEANING OUTSIDE MONSANTO'S OWN PRODUCTION
23 PLANTS, RIGHT?

24 A MEANING FROM THE OUTFALL TO WHEREVER WE
25 QUIT BEING ABLE TO SEE IT WITH THESE TECHNIQUES, YES,
26 MA'AM.

27 Q AND YOU WENT TO DO THAT TESTING, RIGHT?

28 A YES, MA'AM.

1 Q AND YOU FOUND OUT THAT AROCLOR WAS
2 DETECTABLE QUITE A WAYS DOWN, FOR EXAMPLE THE
3 MISSISSIPPI RIVER FROM THE KRUMMRICH PLANT, RIGHT?

4 A WHAT WE ULTIMATELY FOUND WAS THE PCB'S
5 WERE UBIQUITOUS.

6 Q MEANING THEY WERE EVERYWHERE?

7 A YES, MA'AM.

8 Q NOT JUST OUTSIDE OF MONSANTO'S PLANTS BUT
9 IF YOU STARTED RUNNING YOUR SAMPLES THROUGH THIS
10 MACHINE YOU FOUND THAT LOTS OF ENVIRONMENTAL SAMPLES
11 SHOWED PCB'S?

12 A WE FOUND PCB'S IN A LOT OF PLACES, RIGHT.

13 Q HUMAN MILK?

14 A YES, MA'AM.

15 Q DISHWASHING DETERGENT?

16 A YES, MA'AM.

17 Q FISH?

18 A YES, MA'AM.

19 Q SHRIMP?

20 A YES, MA'AM.

21 Q BIRDS?

22 A THAT IS WHAT "UBIQUITOUS" MEANS, YES,
23 MA'AM.

24 Q UBIQUITOUS MEANS WHEN YOU STARTED DOING
25 THE TESTS WHAT YOU FOUND WAS PCB'S WERE EVERYWHERE?

26 A YOU FOUND OUT IF YOU WENT TO LOW ENOUGH
27 LEVELS YOU WOULD SEE PCB'S IN A LOT OF PLACES.

28 WE OBVIOUSLY DIDN'T ANALYZE EVERYTHING.

1 THEY WERE UBIQUITOUS, THAT IS WHAT IT
2 MEANS, WIDELY SPREAD.

3 WE NEED THAT INFORMATION. THAT IS WHAT
4 THIS IS ALL ABOUT.

5 Q YOU WERE CONCERNED -- I TAKE IT AT THAT
6 POINT YOU DIDN'T THINK THE GOVERNMENT PEOPLE WERE TOO
7 ACTIVE; IS THAT RIGHT? I'M LOOKING AT THE SENTENCE,
8 DR. TUCKER, WHERE IT SAYS, "IF THE PCB ACCUSATION
9 TURNS OUT TO BE TRUE AND THE GOVERNMENT PEOPLE BECOME
10 MORE ACTIVE, WE SHOULD PLAN ON EXTENSIVE EVALUATION"?

11 A I THINK WE SHOULD HELP SOLVE THE PROBLEM.
12 TO DO THAT, WE NEEDED INFORMATION.
13 SO I WAS RECOMMENDING THAT WE BECOME MORE
14 ACTIVE.

15 Q BECAUSE YOU WERE CONCERNED IF THE
16 GOVERNMENT PEOPLE BECAME MORE ACTIVE, FINDING PCB'S
17 EVERYWHERE WAS GOING TO BE A BIG PROBLEM FOR
18 MONSANTO, RIGHT?

19 A WELL, I THINK -- I WASN'T SO MUCH WORRIED
20 ABOUT THE BIG PROBLEM WITH MONSANTO AS I WAS WORRIED
21 WITH WHAT YOU PROPOSED AS A SCIENTIFIC TRUTH EARLIER.

22 I THINK WHAT WE WERE TRYING TO DO IS FIND
23 OUT WHAT WAS THE PROBLEM, HOW WIDESPREAD IT WAS.

24 I THINK WE ESTABLISHED THAT WE SHARED OUR
25 INFORMATION VERY FREELY WITH ANYBODY AND EVERYBODY
26 WHO WAS INTERESTED.

27 BECAUSE THE ULTIMATE SOLUTION FROM MY
28 VIEWPOINT AS A SCIENTIST WAS TO DETERMINE WHAT THE

1 PROBLEM WAS AND PROVIDE GOOD, ACCURATE INFORMATION
2 UPON WHICH DECISIONS COULD BE MADE.

3 THIS WAS 25 YEARS AGO.

4 OUR UNDERSTANDING OF WHAT WAS GOING ON IN
5 THE ENVIRONMENT, THINGS OF THAT SORT, CAME FROM
6 THESE KINDS OF STUDIES.

7 Q THE FIRST THING YOU FOUND OUT WHEN YOU
8 RAN AN ENVIRONMENTAL SAMPLE THROUGH YOUR MACHINE TWO
9 YEARS AFTER JENSEN AND WIDMARK HAD REPORTED PCB'S IN
10 THE ENVIRONMENT WAS, YES, IT TURNS OUT THERE ARE
11 PCB'S IN THE ENVIRONMENT, ACCORDING TO OUR OWN TESTS,
12 RIGHT?

13 A RIGHT, ESSENTIALLY RIGHT HERE AT THE
14 OUTFLOW OF THE PLANT WHERE WE WENT FIRST TO VERIFY
15 THAT WE WERE GOING TO FIND THEM.

16 THEN WE GRADUALLY WENT UP.

17 YES, ABSOLUTELY, SURE.

18 Q OKAY. I THINK IN QUESTIONING BY
19 MR. PREUSS YOU INDICATED THAT YOU THOUGHT THAT JENSEN
20 AND WIDMARK HAD JUST FOUND AROCLORS WITH SIX
21 CHLORINES ON THEM; IS THAT RIGHT?

22 A NO.

23 WHAT I SAID WAS THEY FOUND
24 POLYCHLORINATED BIPHENYLS WITH SIX CHLORINES.

25 I DIDN'T SAY THEY FOUND AROCLORS.

26 AS A MATTER OF FACT, I WAS VERY CAREFUL
27 TO STATE THEY DIDN'T FIND AROCLORS.

28 THEY FOUND PCB'S THAT HAD SIX CHLORINES

1 OR BETTER IN THEM.

2 IN EUROPE, THERE WERE A NUMBER OF
3 MANUFACTURERS OF PCB'S IN EUROPE.

4 MONSANTO WE WERE THE SOLE MANUFACTURER IN
5 THE UNITED STATES.

6 BUT, THERE WERE A LOT OF PLACES THAT MADE
7 PCB'S IN EUROPE.

8 Q THE CONCERN WAS IF JENSEN AND WIDMARK ARE
9 FINDING PCB'S IN SWEDEN IT'S LIKELY THERE ARE PCB'S
10 HERE IN THE U.S., RIGHT?

11 A I THINK WE ALSO SUPPLIED PCB'S TO SWEDEN.
12 WE COMPETED ON AN INTERNATIONAL BASIS.

13 Q JENSEN AND WIDMARK DIDN'T -- LOOKING AT
14 EXHIBIT 88, I DON'T KNOW IF THAT'S ON THE SAME?

15 A YES, MA'AM, IT IS.

16 Q IF YOU WOULD TAKE A LOOK AT THAT,
17 PLEASE.

18 JENSEN AND WIDMARK DIDN'T JUST FIND PCB'S
19 WITH SIX CHLORINES ON THEM, THEY FOUND PCB'S WITH
20 FIVE CHLORINES ON THEM, TOO, RIGHT?

21 A THAT COULD BE VERY WELL TRUE.

22 I'M SURE THEY FOUND IN SOME SAMPLES SOME
23 WITH FIVES, SOME WITH SIXES AND SOME WITH SEVENS,
24 ALTHOUGH I DON'T THINK THEY EVER FOUND ANY FOURS.

25 Q YOU DON'T THINK THEY FOUND ANY FOURS?

26 A I DON'T THINK SO.

27 I DON'T RECALL ANY REPORTS OF IT.

28 Q BUT SEEING THIS YOU RECALL THAT IT WASN'T

1 JUST SIXES AND HIGHER BUT THEY ALSO FOUND FIVES?

2 A WHERE ARE YOU SPECIFICALLY?

3 Q WIDMARK WAS FINDING CL FIVE AND CL SIX
4 CHLORINATED BIPHENYLS FROM EXTRACTS OF SALMON AND
5 FROM EXTRACTS OF WASTE SEWAGE SLUDGE?

6 A YEAH, LOW CL SEVENS, CL EIGHTS, SOME CL
7 10.

8 Q RIGHT.

9 SO BACK AT THE TIME, BACK IN 1969, YOU
10 KNEW THAT JENSEN AND WIDMARK WEREN'T JUST FINDING
11 SIXES AND EIGHTS, THEY WERE FINDING CL FIVES, RIGHT?

12 A IN ACCORDANCE WITH WHAT BILL RICHARD
13 STATED IN THIS MEMO.

14 Q WELL WHEN THE MONSANTO EMPLOYEES WENT
15 OVER TO EUROPE IN THE SUMMER OF 1969 TO SURVEY THE
16 RESEARCH THEY CAME BACK AND PROVIDED A REPORT TO YOU,
17 RIGHT?

18 A DON'T GET ME WRONG.

19 IF YOU LOOK AT THE LAST LINE IT STATES
20 THEY DIDN'T FIND ANY CL 11 OR 12. THOSE THINGS DON'T
21 EXIST.

22 THIS WAS SOMEBODY'S THOUGHTS.

23 THERE IS NO 11 CHLORINATED BIPHENYL AND
24 THERE IS NO 12 CHLORINATED BIPHENYL.

25 IT SAYS, "NO CL 11 OR 12 CHLORINATED
26 BIPHENYL WAS FOUND."

27 I'M VERY SUSPICIOUS OF THE THINKING
28 INVOLVED IN THIS PARTICULAR THING.

1 IT WOULDN'T SURPRISE ME IF THEY FOUND
2 FIVE CHLORINATED, BUT I WASN'T AWARE THEY HAD VIA
3 THEIR PUBLICATIONS.

4 Q IT WOULDN'T SURPRISE YOU IF THEY FOUND
5 PCB MOLECULES WITH FIVE CHLORINES ON THEM BECAUSE YOU
6 NEVER GOT PCB MOLECULES WITH FIVE CHLORINES ON THEM
7 TO DEGRADE, RIGHT?

8 A THE PCB'S WITH FIVE MOLECULES ON THEM
9 WERE RESISTANT TO DEGRADATION, YES.

10 Q NO TESTS --

11 A IT WOULDN'T SURPRISE ME IF THEY FOUND
12 THOSE, THAT'S CORRECT.

13 Q NO TEST YOU EVER DID WHILE YOU WORKED
14 WITH MONSANTO SHOWED THAT CL FIVES AND SIXES DEGRADE,
15 RIGHT?

16 A NO TESTS THAT I EVER RAN DID BECAUSE OF
17 THE TIME FRAME REQUIRED FOR THEM TO DEGRADE.

18 HOWEVER, IN WEATHERED SAMPLES THAT HAD
19 BEEN IN THE ENVIRONMENT FOR 20 YEARS AND THINGS OF
20 THAT SORT, THE FIVES NECESSARILY WERE NOT
21 PREDOMINANTLY FOUND.

22 IN FACT, THEY WERE SIX AND ABOVE.

23 IN THE TIME FRAME WE HAD TO DO THE
24 EXPERIMENTATION THERE WAS NOT SUFFICIENT GRADATION OF
25 THE PENTACHLORO.

26 FROM OUR VIEWPOINT THEY WERE NOT
27 DEGRADABLE.

28 THAT DOESN'T MEAN IF YOU WERE CAPABLE OF

1 RUNNING THE EXPERIMENT FOR A LONGER PERIOD OF TIME
2 THEY WOULDN'T DEGRADE.

3 WHAT IT MEANS IS THEY WERE VERY SLOW TO
4 DO SO AND THAT WAS A PROBLEM.

5 Q WHEN YOU SAY NO, YOU DIDN'T FIND ANY
6 SIGNIFICANT DEGRADATION, YOU WERE MEASURING DOWN TO
7 PARTS PER TRILLION AND YOU DIDN'T FIND ANY
8 DEGRADATION, RIGHT?

9 A OKAY. WHAT I WAS MEASURING WAS THE
10 DIFFERENCE BETWEEN PARTS PER BILLION ADDED AND PARTS
11 PER BILLION FOUND LATER.

12 SO WE WERE MEASURING AT THE LEVEL OF
13 PARTS PER BILLION BUT WE WERE MEASURING BETWEEN THE
14 SMALL DIFFERENCE BETWEEN TWO NUMBERS.

15 THAT IS QUITE DIFFERENT FROM WHAT YOU
16 SAID.

17 Q WELL, LET'S TALK ABOUT THIS POINT.

18 I'M GOING TO SHOW YOU EXHIBIT 352.

19 NOW, WHEN YOU WERE DESCRIBING HOW PCB'S
20 WERE MADE, YOU EXPLAINED THAT ALL AROCLORS ARE A
21 MIXTURE OF PCB'S, RIGHT?

22 A CORRECT.

23 Q THAT MEANS THAT AROCLOR 1242 HAS LOTS OF
24 PCB MOLECULES WITH ONLY THREE CHLORINES ON THEM,
25 RIGHT?

26 A CORRECT.

27 Q BUT IT ALSO HAS PCB MOLECULES WITH FIVE
28 CHLORINES ON THEM, RIGHT?

1 A YES.

2 AS A MATTER OF FACT, IT HAS 10 PERCENT OR
3 LESS OF MATERIALS THAT HAVE FIVE CHLORINES AND ABOVE
4 IN THEM.

5 AND WE ESTABLISHED THAT THROUGH ANALYSIS.

6 Q RIGHT.

7 AND ANOTHER WAY TO SAY THAT IS OUT OF
8 EVERY GALLON OF AROCLOR 1242 10 PERCENT OF IT IS
9 MOLECULES WITH FIVE CHLORINES OR ABOVE ON IT, RIGHT?

10 A YES, MA'AM, THAT IS WHAT PERCENTAGE, THAT
11 IS HOW IT WORKED, YES, MA'AM, YOU ARE CORRECT.

12 Q THAT IS WHAT YOU AT MONSANTO CALLED THE
13 HIGHER CHLORINATED PCB'S, RIGHT?

14 A CORRECT.

15 Q AND WHAT YOU FOUND WHEN YOU DID RIVER
16 DIE-AWAY STUDIES WAS NO DEGRADATION OF 1242?

17 A CORRECT.

18 Q AND RIVER DIE-AWAY IS, YOU TAKE REAL
19 RIVER WATER AND YOU PUT A SMALL AMOUNT OF PCB IN IT
20 AND THEN YOU WATCH IT FOR EIGHT WEEKS AND SEE IF
21 ANYTHING HAPPENS TO THE PCB, CORRECT?

22 A CORRECT.

23 Q AND WHEN YOU DID THAT WITH AROCLOR 1242
24 NOTHING HAPPENED WITH THE PCB, RIGHT?

25 A THAT'S CORRECT.

26 I SHOULD POINT OUT TO YOU THAT THINGS
27 LIKE MINERAL OIL AND OTHER KINDS OF PETROLEUM
28 HYDROCARBONS AND THINGS OF THAT SORT ALSO WOULDN'T

1 DISAPPEAR UNDER THOSE CONDITIONS.

2 IT'S NOT A VERY ROBUST TEST.

3 THERE ARE NOT MANY BACTERIA IN THERE AND
4 THINGS OF THAT SORT.

5 THAT IS NOT SURPRISING KNOWLEDGE.

6 Q SO WHEN YOU DIDN'T GET ANY DEGRADATION
7 USING RIVER DIE-AWAY STUDIES, WHICH WAS THE FIRST SET
8 OF STUDIES YOU RAN, RIGHT?

9 A YES.

10 Q THEN YOU WENT TO THIS ACTIVATED,
11 CONTINUOUS ACTIVATED SLUDGE TEST, RIGHT?

12 A RIGHT, SEMI-CONTINUOUS ACTIVATED SLUDGE,
13 YES.

14 Q THAT IS YOU TAKE SEWAGE AND YOU ADD A
15 LITTLE BIT OF PCB TO IT?

16 A LET ME CORRECT YOU.

17 YOU DON'T TAKE SEWAGE. YOU TAKE BACTERIA
18 FROM THE SEWAGE TREATMENT PLANT.

19 THERE IS A BIG DIFFERENCE.

20 I'M SORRY. SEWAGE LIKE WHAT YOU FLUSH
21 DOWN YOUR TOILET?

22 Q EXACTLY.

23 A WHAT GROWS AT THE SEWAGE TREATMENT PLANT
24 AND WHAT BIODEGRADES, THOSE KIND OF THINGS ARE
25 BACTERIA.

26 SO YOU DON'T TAKE THE SEWAGE. YOU TAKE
27 THE BACTERIA.

28 YOU ARE NOT INTERESTED IN THE SEWAGE.

1 Q YOU TAKE SLUDGE THAT HAS A LOT OF
2 MICROBES AND BUGS IN IT, RIGHT?

3 A YES, MA'AM.

4 Q AND YOU PUT A LITTLE BIT OF PCB INTO THIS
5 SLUDGE AND YOU PUT A LOT OF AIR INTO THE SLUDGE AND
6 YOU STIR IT UP, RIGHT?

7 A THAT'S CORRECT.

8 Q AND YOU DID THAT AND YOU FOUND THAT
9 EVERYTHING UP TO HERE YOU COULD GET TO DEGRADE BUT
10 THIS WOULDN'T DEGRADE, RIGHT?

11 A OKAY.

12 WHAT I FOUND, AND THIS IS PUBLISHED
13 INFORMATION THAT WAS REVIEWED IN PEER JOURNALS AND
14 THINGS OF THIS SORT, IF I REMEMBER CORRECTLY, I MAY
15 BE WRONG ON THE EXACT NUMBER, WAS IN A 48-HOUR PERIOD
16 48 PERCENT OF THE AROCLOR, BY WEIGHT, THAT WAS ADDED
17 TO THAT ACTIVATED SLUDGE UNIT WAS BIODEGRADED.

18 AND AFTER LOOKING AT IT FOR A LONG PERIOD
19 OF TIME IT APPEARED THAT THE THINGS THAT WEREN'T
20 DEGRADING IN THAT VERY SHORT PERIOD OF TIME, 48
21 HOURS, WERE THE MORE RESISTANT, HIGHER CHLORINATED
22 ONES, OKAY?

23 WHICH BASICALLY SAID THAT UNDER THESE
24 TEST CONDITIONS EVERYTHING UP TO PENTACHLORO BIPHENYL
25 DISAPPEARS VERY RAPIDLY, BUT THAT SOME OF THESE,
26 WHILE THEY MAY HAVE BEEN DEGRADED WERE NOT DEGRADED
27 DURING THAT 48-HOUR PERIOD. THAT IS A LOT DIFFERENT
28 FROM SAYING THEY NEVER DEGRADED.

1 WHICH I WAS GETTING THE FEELING THAT YOU
2 WERE -- THE WAY YOU WERE INTERPRETING THAT
3 INFORMATION THAT IS WHAT YOU WERE SAYING.

4 Q YEAH, I WAS SAYING THAT.

5 A WELL, THAT WASN'T TRUE.

6 Q NO TEST THAT YOU EVER RAN SHOWED THAT THE
7 FIVES AND SIXES, THIS 10 PERCENT OF THE AROCLOR 1242
8 DEGRADED, RIGHT?

9 A THERE ARE SOME ISOMERS WHICH DO DEGRADE.
10 BUT PREDOMINANTLY WHAT YOU ARE SAYING IS
11 VERY TRUE.

12 IN THE TIME FRAME WE STUDIED THEM THEY
13 DIDN'T DEGRADE.

14 Q OKAY. AND THIS SEMI-CONTINUOUS ACTIVATED
15 SLUDGE TEST, THAT IS NOT THE REAL WORLD, IS IT?

16 A OH, YEAH.

17 VIRTUALLY EVERY WASTE THAT WE PUT OUT
18 THERE GOES THROUGH SEWAGE TREATMENT PLANTS.

19 AND, IN FACT, UNTIL WE REALLY HAD SEWAGE
20 TREATMENT PLANTS AT THE END OF ALL THE PIPES THAT
21 COME OUT OF CITIES, WE HAD A REALLY SEVERE PROBLEM.

22 SO BIODEGRADATION THE SOMETHING WE HAVE
23 CREATED FOR OURSELVES TO CLEAN UP OUR SEWAGE AND IS
24 PROBABLY ONE OF THE BEST WAYS TO GET RID OF THESE
25 KIND OF THINGS.

26 Q YOU ARE NOT SUGGESTING THAT YOU SHOULD
27 PUT PCB'S IN A HUMAN WASTE DISPOSAL PLANT, ARE YOU?

28 A ABSOLUTELY NOT.

1 I AM SUGGESTING THAT ONE OF THE
2 TECHNIQUES USED NOWADAYS IN REMEDIATION OF HAZARDOUS
3 WASTE SITES IS CALLED BIOREMEDIATION.

4 IT INVOLVES THE INCORPORATION OF
5 BACTERIA, SOME BACTERIA WHICH ARE KNOWN TO DEGRADE
6 PCB'S AND THINGS OF THAT SORT IN THE SOIL WITH THE
7 CONSTITUENTS THAT ARE ALREADY THERE AND THEN LETTING
8 THEM DEGRADE.

9 SO THAT IS WHAT I'M SAYING.

10 Q OKAY. LET ME ASK YOU ANOTHER QUESTION.
11 WHAT IF YOU DON'T HAVE ALL OF THESE BUGS
12 AND MICROBES.

13 WHAT IF YOU HAVE AROCLOR 1242 IN A CAN,
14 IN A WAREHOUSE.

15 HOW LONG WILL THAT AROCLOR 1242 LAST
16 WITHOUT BREAKING DOWN?

17 A PROBABLY AS LONG AS YOU PROTECT ITS
18 INTEGRITY.

19 Q IT WILL LAST 150 YEARS, WON'T IT?

20 A I WOULD GUESS.

21 IT'S A LONG EXPERIMENT.

22 I HAVE NO REASON TO BELIEVE THAT IT WILL
23 LAST FOREVER IF YOU KEPT DOING IT LONG ENOUGH.

24 Q DO YOU KNOW IF THERE ARE ANY MICROBES,
25 BUGS OR ANY ORGANIC MATTER IN A NATURAL GAS PIPELINE?

26 A I WOULD IMAGINE THERE ARE SOME, BUT I
27 DON'T THINK IT'S SUPPOSED TO BE THERE.

28 Q THERE IS NO OXYGEN IN A NATURAL GAS

1 PIPELINE, RIGHT?

2 A I HOPE NOT.

3 Q SO IF THERE IS NO AIR -- NO OXYGEN, NO
4 LIGHT, NO MICROBES, IF YOU HAVE PCB'S IN A NATURAL
5 GAS PIPELINE, IF YOU CAN'T GET THEM OUT, THEY ARE
6 GOING TO LAST 150 YEARS, AREN'T THEY?

7 A I DON'T KNOW ABOUT THE 150 YEARS.

8 BUT ARE YOU ASKING ME IF THEY WOULD
9 BIODEGRADE UNDER THOSE CONDITIONS?

10 IT WOULD BE HIGHLY UNLIKELY.

11 THEY WILL STICK AROUND IN THERE FOR A
12 WHILE, IF THAT IS YOUR QUESTION.

13 Q THEY ARE JUST LIKE THE CAN IN THE
14 WAREHOUSE THAT YOU SAID THE PCB'S WOULD STILL BE
15 THERE IN 150 YEARS, RIGHT?

16 A WELL, I DON'T KNOW ABOUT THE 150 YEARS.

17 I DON'T KNOW WHERE YOU COME UP WITH THAT
18 MAGIC NUMBER, EITHER.

19 I KNOW ITS A LONG PERIOD OF TIME. IT
20 HASN'T BEEN DETERMINED.

21 I KNOW UNDER THESE KIND OF CONDITIONS,
22 WHEN YOU PUT FOOD IN A CAN IT LASTS FOREVER. THAT IS
23 WHY YOU DO THAT.

24 I WOULD SAY YES, IF YOU ARE GOING TO PUT
25 IT UNDER THOSE CONDITIONS, IT WILL LAST A LONG TIME.

26 Q OKAY. ALL RIGHT. WHEN YOU STARTED DOING
27 ENVIRONMENTAL TESTS, WHAT YOU FOUND, DR. TUCKER, AS
28 YOU SAID, WAS THAT THESE PCB'S WERE EVERYWHERE,

1 RIGHT?

2 A AT A LOW ENOUGH LEVEL THEY APPEARED TO BE
3 UBIQUITOUS, YES.

4 THEY WERE AROUND, YES.

5 Q SO FOR EXAMPLE, IF YOU LOOK AT EXHIBIT
6 103 -- EXHIBIT 103 ARE ENVIRONMENTAL TESTS DONE
7 OUTSIDE OF MONSANTO'S NEWPORT, ENGLAND PLANT, RIGHT?

8 A YES, MA'AM.

9 Q AND WHAT YOU FOUND SHOWN ON THE MAP THAT
10 IS ATTACHED IS AROCLOR 1242?

11 A YES, MA'AM.

12 Q AND WHEN YOU DID SIMILAR TESTS OUTSIDE OF
13 NATIONAL CASH REGISTER'S PLANT OF THE WATER THERE YOU
14 FOUND AROCLOR 1242, RIGHT?

15 A DO YOU HAVE A DOCUMENT YOU ARE REFERRING
16 TO?

17 I DON'T DOUBT THAT. BUT ARE YOU
18 REFERRING TO A DOCUMENT?

19 Q YEAH, LET ME SHOW IT TO YOU, DR. TUCKER.
20 IF YOU WOULD LOOK AT EXHIBIT 114.
21 DATED DECEMBER 3RD, 1962.

22 A YES, MA'AM.

23 Q AND THAT SHOWS THAT WHEN YOU TAKE SAMPLES
24 OF WATER FROM NCR, AND THOSE ARE THE PEOPLE WHO MADE
25 THE CARBONLESS COPY PAPER, RIGHT?

26 A YES, MA'AM.

27 Q AND THEY MADE THAT WITH AROCLOR 1242?

28 A THAT WAS THE FLUID USED IN IT, YES.

1 Q AND WHEN YOU TOOK THOSE SAMPLES AND RAN
2 THEM THROUGH YOUR MACHINE WHAT YOU FOUND WAS FAIRLY
3 HIGH PARTS PER MILLION OF AROCLOR 1242, RIGHT?

4 A YES.

5 Q AND YOU DID SAMPLES FOR -- AT SOME OF
6 YOUR OTHER LARGE CUSTOMERS' PLANTS, RIGHT?

7 A ABSOLUTELY.

8 WE HAD A PROGRAM WHOSE OBJECTIVE WAS TO
9 HELP OUR CUSTOMERS UNDERSTAND WHERE THEY WERE
10 RELATIVE TO DISCHARGES OF THE MATERIALS THEY WERE
11 USING.

12 Q DID YOU EVER DO ANY TESTS FOR TEXAS
13 EASTERN?

14 A I DON'T PERSONALLY RECALL EVER DOING ANY
15 TESTS, NO.

16 Q DID YOU EVER DO ANY TESTS FOR
17 TRANSWESTERN?

18 A I DON'T PERSONALLY RECALL DOING ANY
19 TESTS.

20 BY THE WAY, THOSE TESTS WOULD BE A MATTER
21 OF RECORD.

22 ALL TESTS THAT WERE DONE WERE RECORDED
23 AND IN LOG BOOKS, THINGS OF THAT SORT.

24 THEY WERE STANDARD PROCEDURES.

25 SO I DON'T RECALL.

26 Q SO AS THE FIRST TESTS WE HAVE SEEN WERE
27 THE FEBRUARY, 1969 TESTS, THAT WOULD INDICATE TO YOU
28 THAT THOSE WERE THE FIRST TESTS, THOSE WERE OUTSIDE

1 SNOW CREEK IN ANNISTON, THAT THOSE WERE THE FIRST
2 ENVIRONMENTAL TESTS THAT YOU RAN IN YOUR MACHINE,
3 RIGHT?

4 A IN THE EXHIBITS WE HAVE LOOKED AT, YOU
5 ARE CORRECT.

6 Q LET'S LOOK AT EXHIBIT 110.

7 A OKAY.

8 Q THAT IS A MEMO YOU WROTE, RIGHT?

9 A YES, MA'AM.

10 Q AND IF YOU LOOK ON THE THIRD PAGE OF IT,
11 DR. TUCKER, IT SAYS 11-10-69?

12 A IN THE FAR RIGHT COLUMN?
13 11-10-69.

14 Q UNDER YOUR NAME THERE?

15 A WHERE ARE YOU AT?

16 IS THAT THE DOCUMENT UP ON THE SCREEN?

17 Q YES, IT IS.

18 A OH, SURE, ON --

19 Q I'M STILL ON THE MEMO.

20 A YOU ARE STILL ON THE MEMO ITSELF.

21 OKAY.

22 YES, MA'AM.

23 Q AND WHAT THIS --

24 A 11-10-69.

25 Q THANK YOU.

26 AND WHAT THIS WAS WAS A SUMMARY OF THE
27 INFORMATION THAT YOU HAD UP TO THAT POINT, NOVEMBER,
28 1969 CONCERNING PCB'S IN THE ENVIRONMENT, RIGHT?

1 A YES, MA'AM.

2 Q AND THE REASON YOU WROTE THAT WAS BECAUSE
3 IN NOVEMBER, 1969 THERE WAS THE FIRST CORPORATE
4 DEVELOPMENT COMMITTEE MEETING, THE UPPER MANAGEMENT
5 OF MONSANTO, WHERE THE ISSUE OF PCB'S WAS GOING TO BE
6 PRESENTED, RIGHT?

7 A WELL, I WISH MY MOTIVES WERE THAT LOFTY.
8 ACTUALLY I WROTE IT BECAUSE BILL RICHARD
9 ASKED ME TO.

10 Q AND MR. RICHARD ASKED YOU BECAUSE HE TOLD
11 YOU, "I HAVE TO GIVE A PRESENTATION TO THE CORPORATE
12 DEVELOPMENT COMMITTEE ABOUT WHAT THIS PROBLEM WAS
13 WITH PCB'S," RIGHT?

14 A NO, MR. RICHARD ASKED ME TO WRITE IT
15 BECAUSE HE ASKED ME TO DO SO AND I WROTE IT BECAUSE
16 HE WAS SOMEBODY WHO NEEDED THAT KIND OF INFORMATION
17 AND WANTED IT.

18 THAT WAS MY JOB.

19 WHAT I'M TRYING TO SAY IS IT WASN'T
20 WRITTEN WITH ANYTHING IN MIND.

21 IT WAS WRITTEN WITH THE ASSIGNMENT IN
22 MIND WHICH WAS TO REVIEW WHAT WE KNEW TO THIS POINT
23 IN TIME AND PUT IT DOWN IN A CONCISE SUMMARY FASHION
24 FOR HIM.

25 SO YOUR IMPLICATION THAT I UNDERSTOOD
26 THEY WERE GOING TO USE IT TO TALK TO THE PRESIDENT,
27 THAT IS REALLY EXTENDING, REACHING A LITTLE BIT.

28 I'M TRYING TO TELL YOU WHY I DID IT

1 BECAUSE THAT IS WHAT I THINK YOU ARE ASKING.

2 Q DID YOU RECEIVE INFORMATION THAT IN
3 NOVEMBER, 1969 THERE WAS THIS CORPORATE DEVELOPMENT
4 COMMITTEE MEETING WHERE THE BUSINESS GROUP DISCUSSED
5 WITH UPPER MANAGEMENT FOR THE FIRST TIME PCB'S?

6 A I DON'T RECALL RECEIVING THAT
7 INFORMATION.

8 AND I MAY OR MAY NOT HAVE BEEN INCLUDED
9 IN THAT.

10 I DON'T THINK I PROBABLY WAS.

11 Q OKAY. WOULD YOU LOOK AT THE SECOND PAGE
12 OF YOUR MEMO, DR. TUCKER.

13 DOWN THERE UP ABOVE THE LAST PARAGRAPH
14 THAT SAYS -- WHOOPS.

15 A "THE INFORMATION TO DATE"?

16 Q "THE INFORMATION TO DATE INDICATES THAT
17 WE HAVE A GLOBAL POLLUTION PROBLEM AT THE MOMENT
18 RESTRICTED TO AQUATIC AREAS BECAUSE OF THE TRANSPORT
19 AND CONCENTRATION OF MARINE INHABITANTS'
20 MECHANISMS."

21 AND THAT WAS YOUR SUMMARY OF WHAT YOU
22 KNEW ABOUT PCB'S BEING UBIQUITOUS IN THE ENVIRONMENT,
23 RIGHT?

24 A IT WAS THE TRUTH AS I KNEW IT AT THAT
25 TIME YES, MA'AM.

26 Q AND IT WAS A REFERENCE TO PCB'S?

27 A YES, MA'AM, THAT'S WHAT THIS IS ABOUT.

28 Q OKAY. YOU THOUGHT THE SOLUTION OF THE

1 PROBLEM WAS FOR MONSANTO TO GO OUT OF THE BUSINESS OF
2 MAKING AROCLOR 1254 AND 1260, RIGHT?

3 A IT WASN'T UP TO ME TO THINK THOSE KINDS
4 OF THINGS. BUT IT WAS A NATURAL CONCLUSION TO DRAW
5 IF THAT IS WHAT WERE BEING FOUND IN THE ENVIRONMENT,
6 IF WE WITHDREW FROM THAT BUSINESS, THAT THEY WOULDN'T
7 BE PUT OUT IN THE ENVIRONMENT ANYMORE.

8 Q AND THAT WAS THE CONCLUSION YOU DID DRAW,
9 THAT MONSANTO SHOULD GO OUT OF THE AROCLOR 1254 AND
10 1260 BUSINESS, RIGHT?

11 A WHAT I'M TRYING TO SAY IS I DIDN'T DRAW
12 THOSE KIND OF CONCLUSIONS FOR THE COMPANY.

13 IT WAS A SUGGESTION OF A PATH THAT COULD
14 BE TAKEN.

15 Q AND WHERE THAT SUGGESTION CAN BE FOUND IS
16 ON PAGE 3 WHERE YOU STATE, UNFORTUNATELY THE SOLUTION
17 TO THE PROBLEM WILL INITIALLY INVOLVE WITHDRAWAL OF
18 1254 AND 1260 FROM THE MARKETPLACE, CORRECT?

19 A THAT'S CORRECT.

20 AS A SCIENTIST THAT IS THE WAY I FELT
21 BASED ON THE INFORMATION I HAD GENERATED UP TO THAT
22 POINT IN TIME.

23 Q FOLLOWED BY A CONCERTED EFFORT TO PROVE
24 THAT AROCLOR 1242 IS BIODEGRADABLE, RIGHT?

25 A RIGHT, TO DEMONSTRATE THAT AROCLOR 1242
26 WAS BIODEGRADABLE AND WAS NOT CONTRIBUTING.

27 Q AND AT THIS TIME, NOVEMBER, 1969, YOU
28 HADN'T STARTED THE BIODEGRADATION STUDIES, RIGHT?

1 A ARE YOU REFERRING TO A DOCUMENT THAT SAYS
2 I HADN'T STARTED THOSE?

3 Q I CAN SHOW YOU DOCUMENTS.

4 I GUESS WHAT I'M LOOKING FOR NOW IS JUST
5 YOUR BEST RECOLLECTION.

6 A I THINK THE BIODEGRADATION STUDIES HAD
7 BEEN STARTED BY 1969.

8 ISN'T THAT WHAT WE ESTABLISHED EARLIER?

9 Q I DON'T THINK SO, BUT I WILL SHOW YOU A
10 DOCUMENT.

11 A THAT'S GREAT. YOU KNOW --
12 OKAY.

13 Q BUT YOU WEREN'T CONVINCED THAT YOU WERE
14 GOING TO BE ABLE TO SHOW THAT AROCLOR 1242 WAS
15 BIODEGRADABLE, RIGHT?

16 A OH, NO, THAT'S NOT TRUE AT ALL.
17 I WAS CONVINCED THAT THAT WAS PROBABLY
18 THE CASE.

19 Q WELL, YOU STATE, "IN ORDER TO ASSURE THAT
20 THERE IS NO -- INSURE THERE IS NO MISUNDERSTANDING,
21 IT SHOULD BE STRESSED THAT THE PROBABILITY OF SUCCESS
22 OF THESE STUDIES" -- AND YOU ARE REFERRING TO THE
23 BIODEGRADATION STUDIES OF AROCLOR 1242 -- "IS ON THE
24 ORDER OF 75 PERCENT." RIGHT?

25 A AT THAT POINT IN TIME THAT WAS THE --
26 THAT WAS THE BET I WAS WILLING TO MAKE.

27 THAT IS PRETTY GOOD ODDS.

28 Q IT TURNED OUT TO HAVE BEEN NOT SUCH GOOD

1 ODDS FOR THE CL FIVES AND SIXES WHICH MAKE UP 10
2 PERCENT OF AROCLOR 1242, RIGHT?

3 A THAT'S CORRECT. THAT IS WHY I WASN'T
4 WILLING TO BET 100 PERCENT.

5 Q YOU ARE THERE AT THAT POINT IN TIME,
6 NOVEMBER, 1969, WAS THAT WHAT YOU WERE ACTUALLY
7 SEEING IN THE ENVIRONMENT WAS AROCLOR 1242, THE
8 BIGGEST SELLER THAT MONSANTO HAD, WHICH WAS IN
9 CARBONLESS CARBON PAPER, WHICH WAS IN TURBINOL, WHICH
10 WAS IN A HOST OF OTHER PRODUCTS, THAT WHAT YOU WERE
11 SEEING WAS AROCLOR 1242 WITH EVERYTHING BUT THE FIVES
12 AND SIXES AND HIGHER DEGRADED, RIGHT?

13 A NO, THAT WASN'T MY OPINION, AT ALL.
14 I DIDN'T HAVE INFORMATION TO SUPPORT THAT
15 AND I STILL DON'T.

16 Q BUT THAT WAS A THEORY THAT YOU HAD,
17 RIGHT?

18 A NO.

19 MY THEORY WAS THAT WHAT WE WERE SEEING IN
20 THE ENVIRONMENT WERE PENTACHLORO BIPHENYLS AND
21 ABOVE.

22 AND THAT THOSE PRODUCTS WERE DOMINANTLY
23 THE MATERIALS THAT WERE PROBABLY ONES THAT WERE
24 CONTRIBUTING TO IT.

25 AND THEREFORE, IF YOU TOOK THOSE OUT OF
26 CIRCULATION, YOU WOULDN'T BE CONTRIBUTING TO THAT
27 LEVEL OF MATERIALS ANYMORE. YOU MIGHT SOLVE YOUR
28 PROBLEM.

1 THAT IS THE WAY I FELT AT THAT POINT IN
2 TIME.

3 AS YOU POINTED OUT, WE DIDN'T HAVE
4 INFORMATION TO SUPPORT THAT SO WE NEEDED TO GENERATE
5 INFORMATION TO SUPPORT THAT PARTICULAR CONCLUSION.

6 Q BUT WHAT YOU SAID TO DR. RICHARD WAS, "IT
7 COULD POSSIBLY BE THAT THE CL FOUR THROUGH CL NINE
8 PCB ISOMERS BEING FOUND ARE WHAT IS LEFT AFTER
9 AROCLOR 1242 HAS BEEN BIODEGRADED"?

10 A THAT IS POSSIBLE.

11 THAT IS WHY WE NEEDED TO DO THESE
12 PARTICULAR EXPERIMENTS.

13 Q OKAY. WHEN YOU LOOK AT THE CHART WITH
14 WHAT YOU EXPLAINED TO MR. PREUSS AS A SUMMARY OF ALL
15 THE RESEARCH YOU COULD FIND ON PCB'S UP TO THIS POINT
16 IN 11-69, THE FIRST RESULTS I SHOW WITH YOUR NAME
17 NEXT TO THEM THAT INDICATE THAT YOU USED THAT MASS
18 SPECTROMETER WHICH WAS THE EXPENSIVE PIECE OF
19 MACHINERY, IS 10-30-69.

20 THAT IS ON THE LAST PAGE THERE.

21 NOW, IS THAT CONSISTENT WITH YOUR
22 RECOLLECTION THAT IT TOOK A YEAR OR MAYBE A YEAR AND
23 A HALF TO GET THAT MACHINE UP AND RUNNING?

24 A THESE ARE ENVIRONMENTAL SAMPLES.

25 WE PROBABLY RAN IT WITH STANDARDS AND
26 THINGS OF THAT SORT, THINGS WE SPIKED EARLIER THAN
27 THAT.

28 YEAH, SURE.

1 THIS IS, YOU KNOW, AT THIS POINT IN TIME,
2 25 YEARS LATER, THIS STUFF LOOKS PRETTY EASY.

3 BUT AT THAT POINT IN TIME THIS WAS ROCKET
4 SCIENCE.

5 THIS WAS NOT EASY.

6 THESE WERE NOT THINGS PEOPLE KNEW.

7 IT WAS LIKE BEING IN A CAVE WITH NO
8 LIGHT.

9 SO INITIALLY YOU KIND OF FELT YOUR WAY
10 AROUND TO SEE WHERE YOU WERE AT. IT TOOK TIME.

11 THESE KINDS OF THINGS DEVELOP
12 EXPONENTIALLY.

13 THEY START OUT SLOW AND AS YOU ACCUMULATE
14 MORE INFORMATION SUDDENLY THINGS START HAPPENING VERY
15 RAPIDLY.

16 I THINK THAT IS BASICALLY WHAT THE RECORD
17 SHOWS.

18 Q YOU DIDN'T WANT TO REINVENT THE WHEEL?

19 A NO.

20 WHAT IT SHOWS IS THAT AS WE GAINED MORE
21 AND MORE KNOWLEDGE WE WOULD BE ABLE TO MOVE FORWARD
22 MORE QUICKLY.

23 I THINK IF YOU LOOK AT THIS AND YOU WOULD
24 TAKE THESE PUBLICATIONS AND YOU WOULD COUNT THEM UP,
25 THE ONES FOR 1966, THE ONE FOR 1967, THE ONES FOR
26 1968, THE ONES FOR 1969, AND YOU WOULD PLOT THOSE ON
27 A CHART THAT HAD YEARS HERE AND NUMBERS HERE, WHAT
28 YOU WOULD FIND OUT IS THAT THERE WERE THREE IN 1966,

1 THREE OR SEVEN IN 1967, THREE OR SEVEN IN 1968 AND IN
2 1969 THERE WERE 93 PUBLICATIONS OF WHICH 75 PERCENT
3 WERE MONSANTO.

4 SO WHAT I'M TRYING TO SAY IS THAT, YOU
5 KNOW, YOU START OUT, UNTIL YOU KNOW WHERE YOU ARE
6 GOING TO GO YOU DON'T DO A LOT.

7 WHEN YOU FIND OUT EXACTLY HOW YOU DO
8 THINGS, IT'S JUST A MATTER OF DOING IT OVER AND OVER
9 AGAIN AS FAST AS YOU CAN. THAT IS RESEARCH AND
10 DEVELOPMENT. THAT IS WHERE WE WERE AND THAT IS WHAT
11 WE WERE DOING.

12 Q THESE ARE DATED 10-30-69, RIGHT?

13 A YES, MA'AM, THESE ARE.

14 Q NOW, FOR THREE YEARS FROM WHEN MONSANTO
15 FIRST LEARNED THAT THE SCIENTISTS IN SWEDEN HAD FOUND
16 PCB'S IN INFANT HAIR, RIGHT?

17 A A LITTLE LESS THAN THREE YEARS, YES.

18 THREE YEARS FOR ALL INTENTS AND PURPOSES,
19 YES, MA'AM.

20 Q IF YOU WANTED TO KNOW IF THOSE WERE PCB'S
21 THAT THEY WERE FINDING, WHY DIDN'T YOU JUST GO OVER
22 TO SWEDEN AND POUR YOUR STUFF INTO THAT SWEDISH
23 MACHINE?

24 A OKAY.

25 FIRST OF ALL, WE HAD PEOPLE THAT WENT TO
26 SWEDEN AND ASSERTED THAT THEY WERE PCB'S.

27 EARLY ON, JUST SHORTLY AFTER THE
28 PUBLICATION, NOBODY DENIED THE FACT THAT THEY WERE

1 PCB'S.

2 IN FACT, WE NEVER DENIED THE FACT THAT
3 THOSE WERE PCB'S.

4 WE AGREED THAT THEY WERE PCB'S.

5 OUR PROBLEM IS THAT WE DIDN'T KNOW WHERE
6 THOSE PCB'S WERE COMING FROM.

7 THEY CERTAINLY WEREN'T DUPLICATES OF OUR
8 AROCOR PRODUCTS THAT WE MANUFACTURED.

9 AND SO FROM OUR VIEWPOINT THEY COULD HAVE
10 BEEN CONTAMINANTS AND FROM SOME OTHER KIND OF
11 PROCESS, THEY COULD HAVE BEEN COMING FROM A LOT OF
12 DIFFERENT PLACES AND THEY WERE ONLY BEING FOUND IN
13 ONE PLACE.

14 SO THEIR NEEDED TO BE A LOT MORE
15 INFORMATION GENERATED TO BEGIN TO FIND OUT WHAT TO DO
16 ABOUT A PRODUCT THAT HAD BEEN MANUFACTURED SAFELY FOR
17 40 YEARS, HAD BEEN USED TO PROTECT PEOPLE IN
18 DIELECTRIC USES AND CAPACITOR USAGES AND TRANSFORMER
19 USAGES AND THINGS OF THAT SORT THAT WERE SAFE
20 MATERIALS.

21 YOU HAD TO HAVE GOOD SCIENTIFIC
22 INFORMATION TO DECIDE WHAT YOU NEEDED TO DO ABOUT
23 THAT PARTICULAR PRODUCT LINE THAT HAD BEEN SO SAFE
24 FOR SO MANY YEARS.

25 SO IT'S JUST A PROCESS OF DOING IT RIGHT
26 AND GENERATING THE INFORMATION THAT PEOPLE NEED TO
27 MAKE THE PROPER KINDS OF DECISIONS.

28 IT TAKES TIME.

1 NOW, IF, IN YOUR ESTIMATION, THREE YEARS
2 IS TOO LONG, YOU HAD TO BE THERE.

3 Q LET ME ASK YOU ABOUT ONE OTHER THING.
4 THAT IS MCS-1016, ARE YOU FAMILIAR WITH
5 THAT PRODUCT?

6 A YES, MA'AM, I AM.

7 Q WHAT IS MCS-1016?

8 A MCS IS AN AROCLOR 1042 WHICH HAS BEEN
9 DISTILLED TO REMOVE THE 10 PERCENT AND ABOVE ISOMERS
10 THAT WERE DETERMINED NOT TO BIODEGRADE OVER A PERIOD
11 OF TIME, I.E. REFRACTORY.

12 Q EXHIBIT 371.

13 SO EXHIBIT 371 SHOWS THAT YOU TAKE
14 AROCLOR 1242 AND YOU TAKE OFF THE ONES THAT DON'T
15 BIODEGRADE, RIGHT?

16 A IT SHOWS THAT IF YOU REMOVE THE 10
17 PERCENT, THAT YOU HAVE A PRODUCT THAT CONTAINS THESE
18 OTHER THINGS.

19 THAT IS WHAT MCS-1016 WAS.

20 I'M NOT SURE IT SHOWS ALL THE THINGS THAT
21 YOU SAID.

22 BUT THAT IS WHAT IT SHOWS.

23 Q AND MONSANTO DETERMINED THAT -- OR YOU
24 DETERMINED THAT FROM AN ENVIRONMENTAL VIEWPOINT
25 MCS-1016 WAS AT LEAST 10 TIMES BETTER THAN AROCLOR
26 1242, RIGHT?

27 A THAT'S CORRECT.

28 Q AND MCS-1016 WAS NEVER USED TO PRODUCE

1 TURBINOL, RIGHT?

2 A I DON'T THINK IT WAS, NO.

3 I'M SURE -- I DON'T KNOW ABOUT THAT, BUT
4 I'M SURE IT WASN'T.

5 Q NOW, YOU WENT OVER WITH MR. PREUSS A
6 DOCUMENT THAT WAS A PCB TASK FORCE PRESENTATION,
7 RIGHT?

8 A YES, MA'AM.

9 Q THAT WAS EXHIBIT 241.
10 WHEN WAS THAT PRESENTATION?

11 A LET ME GET IT.
12 BUT I THINK IT WAS IN MAY OF '72, MAY 15,
13 1972.

14 IT WAS A DOCUMENT -- WHAT WAS THE NUMBER?

15 Q I THINK IT WAS 241.

16 A 241.

17 OKAY. IT WAS MAY 15, 1972.

18 Q OKAY. NOW, BY MAY 15, 1972 MONSANTO
19 WASN'T MANUFACTURING PCB-CONTAINING LUBRICANTS
20 ANYMORE, WAS IT?

21 A YOU ARE TELLING ME.

22 I DON'T KNOW THAT SPECIFICALLY.

23 I DON'T HAVE ANY REASON TO NOT BELIEVE
24 IT.

25 Q DO YOU KNOW WHAT PRODUCTS MONSANTO WAS
26 STILL SELLING IN MAY OF 1972 THAT HAD PCB'S IN THEM?

27 A I DO NOT RECALL.

28 I DO KNOW THAT THEY HAD TAKEN ACTIONS IN

1 THOSE AREAS.

2 AND I'M SURE IF YOU WENT THROUGH RECORDS,
3 YOU COULD DOCUMENT THAT.

4 Q OKAY. LET ME SHOW YOU ANOTHER DOCUMENT,
5 DR. TUCKER.

6 THAT IS EXHIBIT 213.

7 DO YOU HAVE THAT IN FRONT OF YOU?

8 A I THINK SO.

9 Q THAT IS DATED OCTOBER 1ST, 1971, RIGHT?

10 A YES, MA'AM.

11 Q AND YOUR NAME IS THERE, IS THAT YOU? IS
12 THAT A DIFFERENT TUCKER?

13 A I AM NOT AWARE OF ANY J. E TUCKER THAT
14 WORKED FOR MONSANTO, SO I WOULD GUESS THAT WAS
15 PROBABLY ME, TO BE HONEST WITH YOU.

16 Q WHAT THIS DOCUMENT SHOWS IS THAT IN
17 SWEDEN, BY OCTOBER, 1971 PCB'S WERE BANNED, RIGHT?

18 A NO.

19 ACTUALLY I THINK YOU PROBABLY NEED TO
20 READ THE SENTENCE.

21 THE SWEDISH GOVERNMENT HAS BANNED THE
22 IMPORT OF ALL PCB'S AND PCB-CONTAINING PRODUCTS
23 EXCEPT FOR THE DIELECTRIC INDUSTRY.

24 Q AND DIELECTRICS WERE THOSE FLUIDS THAT
25 ARE WELDED INTO CONTAINERS, RIGHT?

26 A I DON'T THINK THEY ARE WELDED.

27 THEY ARE IN A SEALED CONTAINER, YES.

28 Q THEY ARE NOT LUBRICATING OILS USED UNDER

1 HIGH PRESSURE?

2 A NO, THEY ARE A CONTAINED USAGE WHICH --
3 YES, CORRECT.

4 Q AND WHAT THIS DOCUMENT SHOWS IS THAT IN
5 HOLLAND THERE WAS ACTIVE CONSIDERATION OF A BAN OF
6 PCB'S, CORRECT?

7 A THAT IS WHAT IT SAYS, YES.

8 Q AND IF YOU FLIP OVER TO THE NEXT PAGE
9 THIS DOCUMENT SHOWS THAT THE U.N. WILL HOLD
10 CONFERENCES ON THE HUMAN ENVIRONMENT IN THE SPRING OF
11 1972.

12 "A GROUP OF NOBEL SCIENTISTS INTEND TO
13 SPONSOR A RESOLUTION THAT WILL ASK FOR GLOBAL
14 RESTRICTIONS ON PRODUCTION AND USE OF PCB'S," RIGHT?

15 A THAT IS WHAT IT SAYS, YES, MA'AM.

16 Q AND IN JAPAN, ALTHOUGH THERE IS NOT YET A
17 BAN, THERE WAS A LOT OF CONTROVERSY, RIGHT?

18 A THAT IS WHAT IT SAYS.

19 Q SO THIS PCB TASK FORCE PRESENTATION THAT
20 YOU GAVE IN THE SPRING OF 1972 FOLLOWED ALL OF THESE
21 REGULATORY ACTIVITIES, RIGHT?

22 A CHRONOLOGICALLY, YES, MA'AM.

23 MS. GRADY: NOTHING FURTHER AT THIS TIME.

24 THE COURT: ALL RIGHT.

25 REDIRECT, MR. PREUSS?

26 ///

27 REDIRECT EXAMINATION

28 BY MR. PREUSS:

1 Q DR. TUCKER, WERE YOU INVOLVED IN
2 REFORMULATIONS AS PART OF YOUR JOB?

3 A NO, SIR, REFORMULATIONS WERE NOT PART OF
4 MY JOB.

5 MR. PREUSS: NO FURTHER QUESTIONS.

6 THE COURT: MAY THIS WITNESS NOW BE EXCUSED
7 MR. PREUSS?

8 MR. PREUSS: YES, YOUR HONOR.

9 THE COURT: AND MS. GRADY?

10 MS. GRADY: YES, YOUR HONOR.

11 THE COURT: THANK YOU, DR. TUCKER, FOR YOUR
12 ATTENDANCE AT THIS TRIAL.

13 YOU ARE EXCUSED FROM FURTHER ATTENDANCE.

14 A FURTHER WITNESS, MR. PREUSS?

15 MR. PREUSS: WE HAVE ANOTHER READING, YOUR
16 HONOR.

17 THE COURT: ALL RIGHT.

18 MR. ZIMMER: YOUR HONOR, I WOULD LIKE TO READ
19 FROM THE DEPOSITION OF EARL P. FARMER TAKEN ON
20 SEPTEMBER 9, 1992.

21 THE COURT: AND THE LAST NAME IS SPELLED.

22 MR. ZIMMER: F-A-R-M-E-R.

23 THE COURT: GO AHEAD WHEN YOU ARE READY,
24 MR. ZIMMER.

25 MR. ZIMMER: I WILL ALLOW MS. GRADY A MOMENT TO
26 FIND IT.

27 MS. GRADY: THANK YOU.

28 MR. ZIMMER: (READING):

1 Q WOULD YOU STATE YOUR FULL NAME
2 FOR THE RECORD, SIR.
3 A EARL P. FARMER.
4 Q WHAT IS YOUR DATE OF BIRTH, SIR?
5 A DECEMBER 16, 1930.
6 Q AFTER GRADUATING FROM HIGH SCHOOL
7 DID YOU THEN ATTEND LOUISIANA
8 STATE UNIVERSITY IN BATON ROUGE?
9 A YES.
10 Q WAS THERE SOMETHING YOU DID IN
11 BETWEEN?
12 A YEAH, I SERVED IN THE MILITARY
13 BETWEEN START AND FINISH.
14 Q OKAY. ALL RIGHT. WHAT BRANCH OF
15 THE MILITARY DID YOU SERVE?
16 A U.S. ARMY.
17 Q THEN AFTER CONCLUDING YOUR STINT
18 IN THE U.S. ARMY, DID YOU ENROLL
19 IN L.S.U.?
20 A YES.
21 Q DID YOU RECEIVE A BACHELOR OF
22 SCIENCE DEGREE IN CHEMICAL
23 ENGINEERING FROM L.S.U. IN 1957?
24 A YES, I DID.
25 Q AFTER RECEIVING THAT BACHELOR OF
26 SCIENCE DEGREE DID YOU TAKE
27 GRADUATE COURSES IN CHEMICAL
28 ENGINEERING?

1 A YES, I DID.

2 Q AND WHEN WOULD THAT HAVE BEEN?

3 A IN THE EARLY 60'S.

4 Q UPON GRADUATING FROM LOUISIANA

5 STATE UNIVERSITY IN 1957, DID YOU

6 THEN START WORK AT TEXAS EASTERN?

7 A I DID.

8 Q AND WHAT WAS THE FULL NAME OF THE

9 COMPANY YOU STARTED WORK FOR?

10 A TEXAS EASTERN TRANSMISSION

11 CORPORATION.

12 Q MR. FARMER, LET ME DIRECT YOUR

13 ATTENTION TO THE LATE 1950'S,

14 EARLY 1960'S WHEN YOU WERE EITHER

15 A JUNIOR ENGINEER OR AN ASSISTANT

16 ENGINEER IN THE COMPRESSOR

17 STATION SECTION OF THE DESIGN AND

18 CONSTRUCTION GROUP.

19 AT THAT TIME WERE YOU INVOLVED IN

20 SELECTION OF A SYNTHETIC

21 LUBRICANT FOR USE IN CERTAIN

22 TEXAS EASTERN COMPRESSORS AND

23 TURBINES?

24 A YES.

25 Q AND AT THE TIME YOU WERE ASSIGNED

26 THE TASK OF SELECTING A SYNTHETIC

27 LUBRICANT BY FRANK GORDON. WAS

28 THERE ANOTHER INDIVIDUAL WITHIN

1 THE COMPRESSOR STATION SECTION
2 WHO WAS ALSO WORKING ON THAT
3 PROJECT?

4 A YES, I THINK THERE WAS. OLIVER
5 FLETCHER WAS INVOLVED.
6 I THINK HE WAS THE TEAM LEADER.

7 Q WOULD YOU AGREE THAT THERE WAS A
8 TASK FORCE OR STUDY GROUP
9 ASSIGNED TO INVESTIGATE TEXAS
10 EASTERN'S USE OF SYNTHETIC
11 LUBRICANTS?

12 A I WOULD SAY YES.

13 Q AND MR. FLETCHER WAS THE TEAM
14 LEADER OF THAT GROUP?

15 A YES, HE WAS.

16 Q NOW, DO YOU RECALL ANYONE ELSE
17 BESIDES OLLIE FLETCHER AND
18 YOURSELF WHO PARTICIPATED IN THAT
19 STUDY GROUP?

20 A I DON'T RECALL ANYONE ELSE.

21 Q WAS CONRAD MARVIN A MEMBER OF
22 THAT GROUP?

23 A I DON'T THINK SO.
24 HE WAS IN A SUPERVISORY
25 CAPACITY.

26 Q I THINK THAT IS TRUE.
27 NOW, SIR, YOU DON'T CONSIDER
28 YOURSELF A LUBRICATING EXPERT, DO

1 YOU?

2 A I DO NOT.

3 Q WITHIN THAT GROUP WHO WAS IT THAT
4 HAD THE LUBRICATING EXPERTISE?

5 A I DON'T KNOW OF ANY PARTICULAR
6 PERSON THAT WOULD BE AN EXPERT IN
7 LUBRICATING.

8 Q DID YOU SEEK INPUT FROM ANYONE
9 OUTSIDE THE GROUP WITH EXPERTISE
10 IN THE AREA OF LUBRICATION?

11 A I DO NOT RECALL.

12 Q NOW, YOU DID NOT BELONG TO THE
13 AMERICAN SOCIETY OF LUBRICATION
14 ENGINEERS, DID YOU?

15 A NO.

16 Q DO YOU KNOW OF ANYONE AT TEXAS
17 EASTERN AT THAT TIME PERIOD WHO
18 BELONGED TO THE AMERICAN SOCIETY
19 OF LUBRICATION ENGINEERS?

20 A I'M NOT AWARE OF ANYONE WHO WAS A
21 MEMBER.

22 Q AND AS I UNDERSTAND IT, YOU ALSO
23 HAD NO EXPERIENCE OR KNOWLEDGE OF
24 THE INTERNAL SYSTEMS ON A
25 COMPRESSOR, IS THAT TRUE, SIR?

26 A I'M NOT AN EXPERT ON COMPRESSOR
27 DESIGN.

28 Q MY QUESTION REALLY WENT A LITTLE

1 BIT FURTHER THAN THAT.
2 NOT ONLY DO YOU NOT CONSIDER
3 YOURSELF AN EXPERT IN COMPRESSOR
4 DESIGN BUT YOU REALLY DON'T
5 CONSIDER YOURSELF AS HAVING ANY
6 EXPERIENCE OR KNOWLEDGE OF THE
7 INTERNAL WORKINGS OR SYSTEMS OF
8 GAS COMPRESSORS?

9 A I'M AWARE OF THE THEORETICAL
10 WORKINGS OF THE COMPRESSOR.
11 AS TO THE MECHANICAL DESIGN, I
12 HAVE VERY LIMITED KNOWLEDGE.

13 Q OKAY. TO THE BEST OF YOUR
14 KNOWLEDGE, DID OLLIE FLETCHER
15 HAVE KNOWLEDGE OR EXPERIENCE OF
16 THE INTERNAL SYSTEMS OR WORKINGS
17 OF GAS COMPRESSORS?

18 A I REALLY DON'T KNOW.

19 Q WHO IN THE SYNTHETIC LUBRICANT
20 STUDY GROUP HAD SUCH EXPERIENCE
21 OR KNOWLEDGE?

22 A NOBODY IN MY KNOWLEDGE.
23 WE WOULD PULL FROM OTHER GROUPS
24 INFORMATION LIKE THAT.

25 Q IN TERMS OF YOUR PARTICULAR JOB
26 AS PART OF THIS STUDY GROUP AND
27 THAT IS INVESTIGATION OF AND
28 ULTIMATELY SELECTION OF A

1 FIRE-RESISTANT LUBRICANT FOR USE
2 IN CERTAIN TEXAS EASTERN NATURAL
3 GAS COMPRESSORS, AS PART OF THAT
4 STUDY WHO DID YOU GO TO FOR
5 PURPOSES OF THE NECESSARY
6 INFORMATION CONCERNING THE
7 INTERNAL WORKINGS OF THESE
8 NATURAL GAS COMPRESSORS?

9 A OUR BASIC ASSIGNMENT, AS I
10 RECALL, WAS TO EVALUATE THE
11 FLUIDS ON THE MARKET.
12 WE DIDN'T HAVE TO EVALUATE THE
13 INTERNAL DESIGN OF UNITS TO USE
14 THE FLUIDS.

15 Q NOW, I BELIEVE AT SOME POINT YOUR
16 STUDY GROUP DID MAKE A
17 RECOMMENDATION THAT A PARTICULAR
18 LUBRICANT BE USED BY TEXAS
19 EASTERN; IS THAT CORRECT?

20 A OBVIOUSLY A RECOMMENDATION WAS
21 MADE.

22 Q ALL RIGHT. AND TO THE BEST OF
23 YOUR KNOWLEDGE THAT
24 RECOMMENDATION WAS FOLLOWED?

25 A THAT'S CORRECT.

26 Q THE RECOMMENDATION WAS THAT A
27 MONSANTO PRODUCT CALLED OS-81 BE
28 USED AS A SYNTHETIC LUBRICANT,

1 CORRECT?

2 A IT WAS A MONSANTO PRODUCT BUT MY
3 MEMORY IS VERY HAZY AS TO THE
4 SEQUENCE THESE PRODUCTS CAME OUT
5 IN.

6 Q OKAY. IN THE COURSE OF YOUR WORK
7 FOR THIS SYNTHETIC LUBRICANTS
8 WORK, MR. FARMER, YOU REVIEWED
9 MATERIALS RELATING TO SEVERAL
10 MONSANTO PRODUCTS; IS THAT
11 CORRECT?

12 A THAT'S CORRECT.

13 Q DO YOU RECALL REVIEWING MATERIALS
14 RELATING TO MONSANTO'S PYDRAUL
15 LINE?

16 A THE TERM "PYDRAUL" IS FAMILIAR.

17 Q IS IT YOUR BEST RECOLLECTION AS
18 YOU SIT HERE TODAY THAT YOU
19 REVIEWED MATERIALS RELATING TO
20 MONSANTO'S PYDRAUL LINE OF
21 FLUIDS?

22 A TO THE BEST OF MY MEMORY WE
23 REVIEWED ANY MATERIAL THAT WAS
24 FIRE RESISTANT.

25 BUT PYDRAUL IS A FAMILIAR NAME,
26 I'M SURE WE LOOKED AT IT.

27 Q IS IT ALSO TRUE, MR. FARMER, THAT
28 IN 1958 YOU UNDERSTOOD THAT THE

1 CHEMICAL COMPOSITION OF OS-81 WAS
2 A CHLORINATED POLYPHENYL IN A
3 PHOSPHATE ESTER MIX?

4 A THE TERMS ARE FAMILIAR.
5 THE CHEMICAL NAMES ARE FAMILIAR,
6 YES.

7 Q WELL, YOU WOULD AGREE WOULDN'T
8 YOU, MR. FARMER, THAT IN THE
9 COURSE OF YOUR STUDY WITH THIS
10 GROUP YOU DID LEARN FROM MONSANTO
11 WHAT THE CHEMICAL COMPOSITION OF
12 THIS PRODUCT WAS?

13 A THAT IS CORRECT.

14 Q MONSANTO DID NOT ATTEMPT TO HIDE
15 FROM YOU OR YOUR GROUP THE
16 CHEMICAL COMPOSITION OF THIS
17 FLUID, THAT'S CORRECT, ISN'T IT,
18 MR. FARMER?

19 A NO, NO.
20 I'M JUST THINKING.
21 MONSANTO TOLD US THE COMPOSITION
22 OF THE COMPOUNDS.

23 Q WHEN YOU SAY "THE COMPOSITION,"
24 YOU ARE REFERRING SPECIFICALLY TO
25 THE CHEMICAL COMPOSITION; IS THAT
26 CORRECT?

27 A THAT'S CORRECT.

28 Q IS IT YOUR BEST RECOLLECTION AS

1 YOU SIT HERE TODAY, MR. FARMER,
2 ASSISTED BY THAT QUESTION AND THE
3 ANSWER THAT I READ TO YOU FROM
4 YOUR PRIOR SWORN DEPOSITION
5 TESTIMONY THAT IN 1958 IT WAS
6 YOUR UNDERSTANDING THAT THE
7 CHEMICAL COMPOSITION OF
8 MONSANTO'S OS-81 WAS A
9 CHLORINATED POLYPHENYL IN A
10 PHOSPHATE ESTER MIX?

11 A TO THE BEST OF MY MEMORY THAT IS
12 CORRECT.

13 Q AND THAT INFORMATION WAS GIVEN TO
14 YOU BY MONSANTO, CORRECT?

15 A THAT'S CORRECT.

16 Q WAS IT PROVIDED ORALLY, IN
17 WRITING OR BOTH?

18 A BOTH.

19 Q IN YOUR JOB AS A MEMBER OF THE
20 STUDY GROUP EVALUATING
21 FIRE-RESISTANT LUBRICANTS AND
22 ULTIMATELY MAKING A
23 RECOMMENDATION THAT A CERTAIN
24 FIRE-RESISTANT LUBRICANT BE USED,
25 DID YOU PASS ON THE CHEMICAL --
26 DID YOU PASS ON THE CHEMICAL
27 COMPOSITION TO ANYONE ELSE?

28 A I BELIEVE THE CHEMICAL

1 COMPOSITION WAS A MATTER OF
2 RECORD WITHIN TEXAS EASTERN.

3 Q BY THAT YOU MEAN YOU PASSED IT ON
4 BOTH ORALLY AND IN WRITING TO THE
5 APPROPRIATE INDIVIDUALS AT TEXAS
6 EASTERN, CORRECT?

7 A THERE WOULD HAVE BEEN A WRITTEN
8 RECORD, YES.

9 Q DID YOU PREPARE A WRITTEN RECORD,
10 MR. FARMER?

11 A I PREPARED A WRITTEN RECORD.

12 Q AND FORWARDED THAT WRITTEN RECORD
13 TO THE APPROPRIATE INDIVIDUALS
14 THAT YOU WERE REPORTING TO WITHIN
15 THE TEXAS EASTERN ORGANIZATION,
16 CORRECT?

17 A THAT'S CORRECT.

18 Q BUT YOU KNOW THAT A COPY WAS SENT
19 TO THE APPROPRIATE INDIVIDUALS?

20 A OH, YES.

21 Q WOULD YOU AGREE, MR. FARMER, THAT
22 YOU UNDERSTOOD IN 1958 THAT
23 CHLORINATED POLYPHENYLS WAS A
24 CHEMICAL COMPOUND CONTAINING ONE
25 OR MORE CHLORINE ATOMS AND ONE OR
26 MORE MOLECULES OF AN ORGANIC
27 CHEMICAL COMPOUND KNOWN AS A
28 PHENYL?

1 A THAT'S CORRECT.

2 Q WOULD YOU AGREE THAT A

3 CHLORINATED POLYPHENYL COULD ALSO

4 BE -- FORGIVE ME.

5 WOULD YOU AGREE THAT A

6 CHLORINATED POLYPHENYL COULD ALSO

7 BE ACCURATELY DESCRIBED AS A

8 CHLORINATED HYDROCARBON?

9 WAS IT YOUR UNDERSTANDING THAT IN

10 1958 THE CHLORINATED POLYPHENYL

11 COULD ALSO BE DESCRIBED AS A

12 CHLORINATED HYDROCARBON?

13 A SINCE ANY COMPOUND THAT WAS

14 HYDROGEN AND CARBON IS A

15 HYDROCARBON, THE ANSWER WOULD BE

16 YES.

17 Q OKAY. BECAUSE A POLYPHENYL IS A

18 COMPOUND THAT HAS HYDROGEN AND

19 CARBON, RIGHT?

20 A THAT'S CORRECT.

21 Q SO A CHLORINATED POLYPHENYL COULD

22 ALSO BE DESCRIBED AS A

23 CHLORINATED HYDROCARBON, TRUE?

24 A THAT'S CORRECT.

25 Q WITH YOUR EDUCATION AND

26 EXPERIENCE AS A CHEMICAL

27 ENGINEER, DO YOU BELIEVE THERE

28 WOULD HAVE BEEN ANYTHING

1 MISLEADING OR DECEPTIVE IN THE
2 LATE 1950'S AND EARLY 1960'S IN
3 DESCRIBING A CHLORINATED
4 POLYPHENYL AS A CHLORINATED
5 HYDROCARBON?

6 A I DON'T THINK I UNDERSTAND YOUR
7 QUESTION.

8 Q ALL I'M TRYING TO FIND OUT,
9 MR. FARMER, IF YOU THINK IT'S
10 MISLEADING FOR A COMPANY SUCH AS
11 MONSANTO TO DESCRIBE CHLORINATED
12 POLYPHENYL AS A CHLORINATED
13 HYDROCARBON?

14 A BASED ON MY KNOWLEDGE I WOULDN'T
15 EXPECT THAT TO BE MISLEADING.

16 Q WOULD YOU THINK THERE WOULD BE
17 ANYTHING MISLEADING IN DESCRIBING
18 A CHLORINATED BIPHENYL AS A
19 CHLORINATED HYDROCARBON?

20 A WELL, BASED ON THE PREVIOUS
21 ANSWERS IT'S OBVIOUS THAT THE
22 TERMINOLOGY IS INTERCHANGEABLE.

23 Q THAT THERE WOULDN'T BE ANYTHING
24 MISLEADING ABOUT DESCRIBING
25 CHLORINATED BIPHENYL AS A
26 CHLORINATED HYDROCARBON, CORRECT?

27 A THAT'S CORRECT.

28 Q IN CORRESPONDENCE OF STUDY GROUPS

1 THERE WERE PRODUCTS FROM VARIOUS
2 MANUFACTURERS THAT WERE
3 EVALUATED; IS THAT CORRECT,
4 MR. FARMER?
5 A THAT'S CORRECT.
6 Q AMONG THOSE THERE WAS A PHOSPHATE
7 ESTER MANUFACTURED BY CELANESE
8 CORPORATION, A STRAIGHT PHOSPHATE
9 ESTER CALLED CELLULUBE; IS THAT
10 CORRECT?
11 A WE ARE GOING BACK INTO HISTORY,
12 YOU KNOW.
13 Q LET ME ASK YOU THIS.
14 IN THE COURSE OF EVALUATING AND
15 COMPARING THESE VARIOUS
16 LUBRICANTS, THEY WEREN'T ALL
17 CHLORINATED HYDROCARBONS, TRUE?
18 A THAT'S CORRECT.
19 Q OKAY. MONSANTO PRODUCT WAS A
20 CHLORINATED POLYPHENYL OR
21 CHLORINATED BIPHENYL, CORRECT?
22 A WHICH MONSANTO PRODUCT ARE YOU --
23 Q OKAY. WELL, THERE WERE DIFFERENT
24 PRODUCTS MANUFACTURED BY MONSANTO
25 TO THE BEST OF YOUR
26 UNDERSTANDING. ONE WAS A
27 CHLORINATED POLYPHENYL, ONE WAS A
28 CHLORINATED BIPHENYL, CORRECT?

1 A I'M A LITTLE APPREHENSIVE THAT WE
2 ARE THROWING TERMS AROUND THAT
3 ARE TOO INTERCHANGEABLE AND HAVE
4 BEEN USED INTERCHANGEABLY IN THE
5 PAST THAT IT'S GOING TO GET
6 CONFUSING.

7 Q WAS IT YOUR UNDERSTANDING THAT
8 ALL OF THE PRODUCTS BEING
9 CONSIDERED BY MONSANTO,
10 MANUFACTURED BY MONSANTO AND BY
11 THAT I MEAN THE OS-81 AND THE
12 MCS-153 WERE SOME KIND OF
13 CHLORINATED POLYPHENYL, MEANING
14 CHLORINE ATOMS PLUS MORE THAN ONE
15 PHENYL ATOMS; IS THAT CORRECT?

16 A TO THE BEST OF MY MEMORY, THAT IS
17 CORRECT.

18 Q ALL RIGHT. THE COMPETITOR
19 PRODUCTS BEING CONSIDERED WERE
20 NOT CHLORINATED POLYPHENYLS,
21 CORRECT?

22 A I DON'T RECALL.

23 Q DO YOU RECALL THAT AT LEAST ONE
24 OF THE OTHER PRODUCTS THAT WAS
25 BEING CONSIDERED WAS A STRAIGHT
26 PHOSPHATE ESTER BLEND WITH NO
27 CHLORINATED POLYPHENYLS?

28 A TO THE BEST OF MY MEMORY, YES,

1 THERE WAS.

2 Q SO IN MAKING YOUR FINAL SELECTION
3 YOU KNEW THERE WERE
4 NON-CHLORINATED OPTIONS
5 AVAILABLE, TRUE?

6 A THAT'S CORRECT.

7 Q WHAT WAS THE PROBLEM WITH THE
8 COMPETITOR PRODUCT THAT DID NOT
9 CONTAIN POLYCHLORINATED
10 BIPHENYLS?

11 A THE MOST SIGNIFICANT PROPERTY OF
12 THE MONSANTO PRODUCTS WAS ITS
13 STABILITY.

14 Q DID YOUR GROUP PRIORITIZE WHAT
15 PROPERTIES WERE THE MOST
16 IMPORTANT FOR THE PUMPS IN YOUR
17 DECISION?

18 A NO, WE DID NOT PUT PRIORITIES ON
19 PROPERTIES, WE TRIED TO FIND THE
20 BEST PRODUCT TO MEET THE
21 GUIDELINE.

22 Q WOULD YOU AGREE THAT THREE
23 IMPORTANT QUALITIES WERE FIRE
24 RESISTANT, EFFECTIVE LUBRICATION
25 AND STABILITY?

26 A THAT IS THREE IMPORTANT
27 PROPERTIES, YES.

28 Q WOULD YOU AGREE THAT THOSE WERE

1 THE THREE MOST IMPORTANT
2 PROPERTIES?

3 A YES, I THINK SO.

4 Q YOUR GROUP CONCLUDED THE MONSANTO
5 PRODUCT WHICH CONTAINED
6 POLYCHLORINATED BIPHENYLS WAS THE
7 BEST IN TERMS OF MEETING THOSE
8 THREE PROPERTIES?

9 A AT THAT TIME, YES.

10 Q WAS THE REASON THE
11 NON-POLYCHLORINATED BIPHENYL
12 PRODUCT WAS NOT AS EFFECTIVE,
13 THAT IT TENDED TO DECOMPOSE AND
14 OXIDIZE?

15 A ON SOME OF THE PRODUCTS, YES.

16 Q AND THE MONSANTO POLYCHLORINATED
17 BIPHENYL PRODUCTS TENDED NOT TO
18 DECOMPOSE AND OXIDIZE, CORRECT?

19 A IT HAD A LONGER LIFE THAN OTHER
20 PRODUCTS BEFORE DECOMPOSITION AND
21 OXIDATION BECAME SIGNIFICANT.

22 Q IT WOULDN'T DECOMPOSE DURING LONG
23 DURATIONS OF OPERATION, CORRECT?

24 A NO, I COULDN'T SAY THAT.

25 Q WELL, IT WOULDN'T DECOMPOSE
26 DURING LONGER DURATION OF
27 OPERATIONS THAN THE COMPETITOR
28 PRODUCTS, CORRECT?

1 A BASED ON WHAT OUR EXPERIENCE IS,
2 THE STABILITY OF THE PRODUCT
3 INDICATED A MUCH LONGER LIFE
4 BETWEEN OIL CHANGES.

5 Q WOULD YOU AGREE, MR. FARMER,
6 THEN, THAT THE PREDOMINANT
7 CHARACTERISTIC OF OS-81 THAT LED
8 TO ITS COLLECTION WAS ITS
9 INHERENT STABILITY?

10 A I THINK WE PREVIOUSLY AGREED THAT
11 WAS CORRECT.

12 Q AND WAS IT YOUR UNDERSTANDING IN
13 1958 THAT IT WAS THE POLYPHENYL
14 COMPONENT THAT GAVE THE MONSANTO
15 LUBRICANT ITS INHERENT STABILITY,
16 CORRECT?

17 A TO THE BEST OF MY MEMORY, THAT IS
18 THE UNDERSTANDING.

19 Q AND THAT WOULD BE SOMETHING YOU
20 LEARNED FROM MONSANTO?

21 A THAT'S CORRECT.

22 Q IS IT YOUR UNDERSTANDING THAT
23 THIS MONSANTO LUBRICANT WAS USED
24 FOR BOTH THE TURBINE AND THE
25 COMPRESSOR, THAT THEY HAD A
26 COMMON OIL SYSTEM?

27 A SOME MACHINES HAD A COMMON OIL
28 SYSTEM.

1 Q WAS IT YOUR UNDERSTANDING THAT
2 THIS MONSANTO LUBRICANT WAS USED
3 IN THE SEAL OIL SYSTEM OF THE
4 COMPRESSOR?
5 A IT HAD TO BE IN THE COMMON
6 SYSTEM.
7 Q OKAY. WAS IT DISCUSSED WITH
8 MONSANTO?
9 A WELL, I DON'T KNOW.
10 Q YOU DIDN'T ADVISE MONSANTO ABOUT
11 THAT FACTOR?
12 A NO. WE WEREN'T COMPRESSOR
13 DESIGNERS.
14 WE DIDN'T TRY THAT.
15 Q DO YOU KNOW WHO IT WAS THAT ACTED
16 AS THE POINT PERSON WITH MONSANTO
17 IN TERMS OF THE COMPRESSOR DESIGN
18 AND OPERATION?
19 A NO, I DON'T.
20 Q NOW, AS I UNDERSTAND IT,
21 MR. FARMER, AT SOME POINT TEXAS
22 EASTERN SWITCHED FROM THE
23 MONSANTO OS-81 LUBRICANT TO
24 MONSANTO MCS-153; IS THAT YOUR
25 UNDERSTANDING?
26 A YES.
27 Q WAS IT YOUR UNDERSTANDING THAT
28 THE NEW MONSANTO LUBRICANT THAT

1 WAS SWITCHED OVER TO THE MCS-153,
2 THAT ONE OF THE QUALITIES THAT IT
3 HAD WAS THAT IT HAD A LOWER POUR
4 POINT WHICH MADE IT MORE
5 EFFECTIVE FOR USE IN COLDER
6 CLIMATE OR DURING THE WINTER
7 MONTHS?

8 A TO THE BEST OF MY MEMORY THAT'S
9 CORRECT.

10 Q WHEN YOU KNEW AT THAT TIME THAT
11 THE SWITCHOVER OCCURRED, THAT
12 MCS-153 WAS A CHLORINATED
13 BIPHENYL, CORRECT?

14 A THAT'S CORRECT.

15 Q AND MONSANTO PROVIDED THIS
16 INFORMATION, CORRECT?

17 A THAT'S CORRECT.

18 Q AND IT WAS YOUR UNDERSTANDING, IN
19 FACT, THAT THERE WERE MORE THAN
20 ONE CHLORINE ATOMS ATTACHED TO
21 THE BIPHENYL WHICH WOULD MAKE IT
22 A POLYCHLORINATED BIPHENYL,
23 CORRECT?

24 A THAT'S CORRECT.

25 Q JUST AS THERE WAS A WRITTEN
26 DOCUMENT WITHIN TEXAS EASTERN
27 ADVISING OF THE CHEMICAL
28 COMPOSITION OF THE OS-81, WAS

1 THERE A WRITTEN DOCUMENT ADVISING
2 OF A CHEMICAL COMPOSITION OF
3 MCS-153?

4 A YES, THERE HAD TO BE.

5 Q DID YOU HAVE ANY INVOLVEMENT AT
6 ALL IN THE DECISION TO USE THE
7 MONSANTO SYNTHETIC LUBRICANT IN
8 ONE OF THE REPLACEMENT
9 COMPRESSORS AT THIS CORONA
10 STATION?

11 A DO YOU MEAN, DID I HAVE ANY
12 PERSONAL INVOLVEMENT AT THAT
13 TIME?

14 Q YES.

15 A NO.

16 Q AT SOME POINT DID YOU HAVE SOME
17 PERSONAL INVOLVEMENT IN THE
18 CORONA STATION ON THE
19 TRANSWESTERN SYSTEM?

20 A I DO NOT EVEN KNOW WHERE IT IS.
21 I HAD NO INVOLVEMENT WITH THE
22 TRANSWESTERN COMPRESSOR STATIONS,
23 EVER.

24 Q IN ROUGHLY JANUARY OF 1972 DID
25 YOU LEARN THAT MONSANTO WAS
26 WITHDRAWING THE MCS-153 AND
27 TURBINOL-153 FROM THE MARKET?

28 A I DO NOT KNOW WHEN, BUT THE

1 OPERATING DEPARTMENT INFORMED US
2 THAT MONSANTO WOULD NO LONGER
3 PROVIDE THEIR PRODUCTS.

4 Q AND AT THAT TIME YOU LEARNED THAT
5 THE REASON FOR MONSANTO CEASING
6 THE PRODUCTION OF THOSE PRODUCTS
7 WAS THAT THERE WAS SOME CONCERN
8 THESE PRODUCTS PERSISTED IN THE
9 ENVIRONMENT AND PRESENTED AN
10 ENVIRONMENTAL HAZARD?

11 A I DID NOT LEARN THAT.

12 Q WHEN DID YOU FIRST LEARN THAT?

13 A I DO NOT REMEMBER. I DO NOT
14 RECALL THE TIME FRAME.

15 Q NOW, MR. FARMER, IS IT YOUR
16 RECOLLECTION NOW, HAVING READ
17 YOUR PRIOR TESTIMONY AND THIS
18 EXHIBIT, THAT, IN FACT, YOU WERE
19 TOLD IN THIS TIME FRAME WHEN
20 MONSANTO WITHDREW THESE PRODUCTS
21 FROM THE MARKET THAT THE REASON
22 MONSANTO WAS WITHDRAWING THEM
23 FROM THE MARKET IS THAT A MAJOR
24 INGREDIENT OF THESE PRODUCTS WAS
25 PCB OR POLYCHLORINATED BIPHENYL
26 AND PCB'S WERE FOUND TO HAVE
27 PERSISTED IN THE ENVIRONMENT WITH
28 TRACES HAVING BEEN FOUND IN FISH,

1 BIRDS, BODY FATS, ET CETERA. IS
2 THAT YOUR RECOLLECTION?

3 A MY RECOLLECTION AS PREVIOUSLY
4 STATED WAS I DIDN'T KNOW WHY THEY
5 WITHDREW IT UNTIL THIS MEMO CAME
6 OUT.

7 I DID NOT REMEMBER THE TIME
8 FRAME.

9 I KNEW THEY HAD WITHDRAWN IT.
10 THEN WE GOT THIS INFORMATION.
11 SO I DIDN'T REMEMBER THE TIME
12 FRAME.

13 Q SO AT THE TIME THIS MEMO OF
14 JANUARY 17, 1972 CAME OUT, THAT
15 IS WHEN YOU LEARNED THAT THE
16 REASON THAT MONSANTO WAS
17 WITHDRAWING THESE PRODUCTS WAS
18 BECAUSE OF ENVIRONMENTAL
19 PERSISTENCE; IS THAT CORRECT?

20 A I'M NOT SURE THAT IS WHAT IT SAYS
21 NOW. IT SAYS IT TENDS TO BE.
22 THAT WASN'T REAL CLEAR AT THE
23 TIME THAT IT WAS GOING TO BE A
24 PROBLEM.

25 Q AFTER RECEIVING THIS MEMO DID YOU
26 HAVE ANY FURTHER INVOLVEMENT IN
27 THIS ISSUE OF THE MONSANTO
28 LUBRICANTS AND THEIR USE IN THE

1 TEXAS EASTERN SYSTEM?

2 A NO, I DIDN'T.

3 Q TAKING A LOOK HERE AT THIS TEXAS
4 EASTERN MEMO, MR. FARMER, AND
5 THIS IS EXHIBIT 594, IT SHOWS
6 THAT YOU WERE, IN FACT, IN
7 ATTENDANCE AT THIS MEETING; IS
8 THAT CORRECT?

9 A IT WOULD APPEAR SO, YES.

10 Q DO YOU RECALL BEING PRESENT AT
11 THAT MEETING?

12 A NO, I DON'T.

13 Q DO YOU HAVE ANY REASON TO BELIEVE
14 THAT THIS MEMO IS IN ERROR TO THE
15 EXTENT THAT IT SHOWS THAT YOU
16 WERE IN ATTENDANCE?

17 A NO, I DON'T.

18 Q AS A CHEMICAL ENGINEER WITH TEXAS
19 EASTERN, WERE YOU CALLED ON AT
20 ALL FROM 1972 TO 1981 TO OFFER
21 ANY INPUT INTO THE ISSUE OF PCB'S
22 IN THE COMPRESSOR LUBRICANTS THAT
23 WERE BEING USED AT CERTAIN
24 STATIONS?

25 A I DON'T RECALL A TIME FRAME.
26 BUT AT ONE STAGE WE WERE ASKED TO
27 LOOK AT POTENTIAL METHODS TO
28 REMOVE ANY PCB'S OR SYNTHETIC

1 LUBRICANTS FROM OUR SYSTEM.

2 THE COURT: EXCUSE ME, MR. ZIMMER, ABOUT HOW
3 MUCH LONGER IN TERMS OF PAGES OR TIME?

4 MR. ZIMMER: WE BETTER BREAK.

5 THE COURT: WE WILL TAKE THE AFTERNOON BREAK
6 NOW, LADIES AND GENTLEMEN.

7 REMEMBER THAT TOMORROW THE NOON HOUR WILL
8 BE EXTENDED SO WE WILL BE IN RECESS FROM 12 TO 2:00.

9 I WILL REMIND YOU, AGAIN, NOT TO THINK
10 ABOUT THE CASE, FORM ANY IMPRESSION OR SAY ANYTHING
11 TO ANY OTHER PERSON ABOUT ANYTHING HAVING TO DO WITH
12 IT.

13 HAVE A NICE EVENING.

14 WE WILL RESUME TOMORROW MORNING AT 9:30.

15
16 (AT 4:00 P.M., THE PROCEEDINGS WERE ADJOURNED
17 UNTIL TUESDAY, DECEMBER 21, 1993 AT 9:30 A.M.)
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28

1 SUPERIOR COURT OF THE STATE OF CALIFORNIA
2 FOR THE COUNTY OF LOS ANGELES
3 DEPARTMENT NO. 31 HON. G. KEITH WISOT, JUDGE
4
5 TRANSWESTERN PIPELINE COMPANY,)
6 A DELAWARE CORPORATION,)
7 PLAINTIFF- RESPONDENT,)
8 VS.)
9 MONSANTO COMPANY AND DOES 1)
10 THROUGH 200, INCLUSIVE,)
11 DEFENDANTS- APPELLANTS.)
12
13 STATE OF CALIFORNIA)
14 COUNTY OF LOS ANGELES) SS.
15
16 I, DAVID ALAN SALYER, OFFICIAL REPORTER OF THE
17 SUPERIOR COURT OF THE STATE OF CALIFORNIA, FOR THE
18 COUNTY OF LOS ANGELES, DO HEREBY CERTIFY THAT THE
19 FOREGOING PAGES, 3,476 THROUGH 3,682, INCLUSIVE,
20 COMPRISE A TRUE AND CORRECT TRANSCRIPT OF THE
21 PROCEEDINGS HELD IN THE ABOVE-ENTITLED MATTER, AS
22 DESIGNATED BY COUNSEL TO BE INCLUDED IN THE
23 TRANSCRIPT ON APPEAL, REPORTED BY ME ON December 20,
24 1993.
25
26 DATED THIS _____ DAY OF APRIL, 1994.
27
28 _____, CSR # 4410
OFFICIAL REPORTER