IN THE CIRCUIT COURT OF CALHOUN COUNTY, ALABAMA

SABRINA ABERNATHY, ET AL.,

PLAINTIFFS, CIVIL ACTION CV-96-269

VS. (CONSOLIDATED)

MONSANTO COMPANY, ET AL.,

DEFENDANTS.

VIDEOTAPE DEPOSITION OF E. SCOTT TUCKER, III

PURSUANT TO NOTICE OF DEPOSITION AND/OR AGREEMENT IN THE ABOVE-ENTITLED CASE, A VIDEOTAPE DEPOSITION WAS TAKEN ON THE 5TH DAY OF JANUARY, 1999, COMMENCING AT APPROXIMATELY 12:55 P.M., ATTENDED BY COUNSEL AS FOLLOWS:

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APPEARANCES:

CHARLES E. FELL, JR., ESQUIRE, SUITE 200, 304 W. LIBERTY STREET, LOUISVILLE, KENTUCKY 40202,

ATTORNEY FOR PLAINTIFFS,

D. MARSH PRAUSE, ESQUIRE, OF THE FIRM OF SMITH, HELMS, MULLISS & MOORE, SUITE 1400, 300 NORTH GREENE STREET, POST OFFICE BOX 21927, GREENSBORO, NORTH CAROLINA 27401,

ATTORNEY FOR DEFENDANTS.

VIDEOGRAPHER:	RYAN GOODMAN HUNTRIDGE VIDEO PRODUCTIONS 104-B SHAW STREET GREENVILLE, S.C. 29609 (864) 271-3348
DEPOSITION REPORTED BY:	LINDA L. WILSON DEPOSITIONS AND..., INC. P.O. BOX 10268 GREENVILLE, S.C. 29603 (864) 235-3518

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EXHIBITS:

(PLAINTIFFS' EXHIBIT NUMBER 3 RETAINED BY COUNSEL)

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PLAINTIFFS' EXHIBIT NUMBER 3 MARKED..... 113

PURSUANT TO NOTICE AND/OR AGREEMENT TO TAKE DEPOSITIONS, THE WITHIN DEPOSITION WAS TAKEN BY THE ABOVE REPORTER, A NOTARY PUBLIC, PURSUANT TO RULE 30, AND IN PARTICULAR RULE 30(B)(4), OF THE ALABAMA RULES OF CIVIL PROCEDURE, BY CONSENT OF ALL PARTIES AT THE OFFICES OF CLARKSON, FORTSON, WALSH & RHENEY, 117 MANLY STREET, GREENVILLE, SOUTH CAROLINA.

STIPULATIONS:

BY MR. PRAUSE:

MR. FELL, I'D JUST LIKE TO CONFIRM ON THE RECORD OUR UNDERSTANDING THAT DR. TUCKER HAS YET TO REVIEW COMPLETELY AND DIGEST ALL OF THE DOCUMENTATION PERTAINING TO ENVIRONMENTAL SAMPLING IN THIS CASE AND THAT WE RESERVE THE RIGHT TO BRING HIM BACK FOR ADDITIONAL TESTIMONY AFTER THE CONCLUSION OF TODAY'S TESTIMONY, BY APPROPRIATE MEANS, IN ADVANCE OF TRIAL BY WORKING WITH YOU TO DO THAT.

BY MR. FELL:

THAT'S MY UNDERSTANDING.

BY MR. PRAUSE:

OKAY. THANK YOU.

WAIVER:

COUNSEL AGREED THAT BOTH THE READING OVER OF AND SIGNING OF THE DEPOSITION ARE NOT HEREBY DISPENSED WITH AND WAIVED.

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THE DEPONENT AGREED THAT BOTH THE READING OVER OF AND SIGNING OF THE DEPOSITION ARE NOT HEREBY DISPENSED WITH AND WAIVED.

(COURT REPORTER MARKS EIGHT-PAGE DOCUMENT ENTITLED "EXHIBIT #1, CURRICULUM VITAE" AS PLAINTIFFS' EXHIBIT NUMBER 1, FOR ATTACHMENT TO THE DEPOSITION)

(COURT REPORTER MARKS TWO-PAGE DOCUMENT ENTITLED "EXPERT REPORT OF E. SCOTT TUCKER, III, PH.D." AS PLAINTIFFS' EXHIBIT NUMBER 2, FOR ATTACHMENT TO THE DEPOSITION)

** ** **

THE DEPONENT WAS DULY SWORN TO TELL THE TRUTH, THE WHOLE TRUTH, AND NOTHING BUT THE TRUTH OF HIS OWN KNOWLEDGE CONCERNING THE MATTER HEREIN.

E. SCOTT TUCKER, III, BEING DULY SWORN, TESTIFIED AS FOLLOWS:

DIRECT EXAMINATION BY MR. FELL:

Q. DR. TUCKER, PLEASE STATE YOUR FULL NAME FOR THE RECORD.

A. MY NAME IS EARL SCOTT TUCKER THE THIRD.

Q. MY NAME IS CHARLIE FELL, AND I REPRESENT THE PLAINTIFFS IN A CASE FILED AGAINST MONSANTO IN ANNISTON, ALABAMA.

IT'S MY UNDERSTANDING THAT YOU HAVE BEEN RETAINED BY MONSANTO AS AN EXPERT WITNESS. IS THAT YOUR UNDERSTANDING?

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A. YES, SIR.
Q. HAVE YOU GIVEN DEPOSITION TESTIMONY BEFORE?
A. YES.
Q. SO YOU UNDERSTAND THAT I'M GOING TO ASK YOU A SERIES OF QUESTIONS. IF YOU DON'T UNDERSTAND MY QUESTION OR DON'T HEAR IT PROPERLY, PLEASE ASK ME TO REPEAT IT. OTHERWISE I WILL ASSUME THAT YOU UNDERSTAND MY QUESTION.
A. CORRECT.
Q. LET'S FIRST TALK A LITTLE BIT ABOUT PRIOR TESTIMONY OR PRIOR DEPOSITIONS. WHAT CASES HAVE YOU TESTIFIED IN?
A. I THINK THE FIRST CASE THAT I PROVIDED TESTIMONY IN FOR MONSANTO WAS THE OUTBOARD MARINE CASE. IT WAS A NUMBER OF YEARS AGO, AND IT INVOLVED PCB'S THAT WERE USED AS PRODUCT BY OUTBOARD MARINE THAT FOUND THEIR WAY INTO THE WAUKEGAN AREA AND THINGS OF THAT SORT. AND I WAS DEPOSED IN STAMFORD, CONNECTICUT WHERE I HAPPENED TO RESIDE AND WORK AT THE TIME. THE TESTIMONY, I BELIEVE, WAS PRESENTED IN THE CHICAGO CIRCUIT COURT IF I REMEMBER CORRECTLY. THAT WAS THE VERY FIRST TIME THAT I GOT INVOLVED IN THIS KIND OF ACTIVITY.
Q. DO YOU REMEMBER WHAT YEAR IT WAS YOU WERE DEPOSED?
A. NO. I COULD DETERMINE IT. IT HAD TO BE BEFORE 1985

BECAUSE I LEFT CONNECTICUT IN 1985 AND MOVED TO CHICAGO. SO THAT WAS -- AND I THINK I WENT TO CONNECTICUT IN '78. SO SOMEWHERE BETWEEN 1978 AND 1985.

Q. AND I ASSUME YOU PREPARED AN EXPERT WITNESS REPORT IN THAT CASE. IS THAT CORRECT?

A. IN THAT PARTICULAR CASE I BELIEVE I TESTIFIED AS A FACT WITNESS RATHER THAN AS AN EXPERT WITNESS. HOWEVER, A LOT OF TIMES, BECAUSE OF THE TECHNICAL ASPECT OF WHAT I TALK ABOUT DURING MY EMPLOYMENT WITH MONSANTO, I GET QUALIFIED AS BOTH.

Q. WHAT CASE DID YOU TESTIFY IN OR GIVE A DEPOSITION IN NEXT?

A. THE NEXT ONE THAT COMES TO MIND WAS THE TRANSWESTERN PIPELINE CASE, AND THAT ACTUALLY WENT TO TRIAL IN LOS ANGELES, AND I PROVIDED TESTIMONY AT THAT ONE. I'M SURE I WAS DEPOSED PRIOR TO THAT, BUT I DON'T REMEMBER SPECIFICALLY.

Q. AND THAT WAS IN L.A. CIRCUIT COURT?

A. YES.

Q. WHAT WAS THE NEXT CASE THAT YOU TESTIFIED IN?

A. LET ME THINK. MOST RECENTLY I WAS DEPOSED IN -- IT WAS THE DRYER -- IS THAT CORRECT? -- THE DRYER ---

BY MR. PRAUSE:

IT'S DYER.

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WITNESS RESUMES ANSWER:

A. DYER. I'M SORRY. D-Y-E-R. EVEN THOUGH I'M NOT PRONOUNCING IT CORRECTLY, THAT'S THE WAY IT'S SPELLED. AND THAT WAS THE TWENTY-NINTH AND THIRTIETH OF DECEMBER, I THINK, OF THIS YEAR -- OF LAST YEAR. EXCUSE ME.

Q. OF 1998?

A. YES. THAT'S CORRECT.

Q. OTHER THAN OUTBOARD MARINE, TRANSWESTERN PIPELINE, AND DYER, HAVE YOU BEEN DEPOSED OR TESTIFIED IN ANY OTHER CASES?

A. THERE ARE A FEW OTHERS, AND THOSE RECORDS CAN BE PRODUCED, BUT THOSE ARE THE ONES THAT COME TO MIND RIGHT NOW.

Q. AND YOU'VE TESTIFIED ON BEHALF OF MONSANTO IN ALL THREE OF THOSE CASES; IS THAT CORRECT?

A. YES, I DID.

Q. DO YOU REMEMBER ABOUT WHAT YEAR IT WAS THAT YOU TESTIFIED IN TRANSWESTERN PIPELINE?

A. I WOULD PREFER TO DEFER TO THE RECORD BECAUSE I'D HAVE TO JUST GUESS.

Q. CAN YOU GIVE ME YOUR BEST GUESS ABOUT WHAT YEAR IT WAS, WHAT DECADE?

A. OH, THE DECADE IS FAIRLY EASY. LET ME THINK FOR A SECOND. IT HAD TO BE MAYBE ABOUT FIVE YEARS AGO, I

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WOULD GUESS, MAYBE. MAYBE SEVEN YEARS AGO. SOMEWHERE IN THAT RANGE. I'M SORRY I CAN'T REMEMBER THAT, BUT THOSE AREN'T THINGS I COMMIT TO MEMORY.

Q. THAT'S ALL RIGHT.

WAS THE STYLE OF THE CASE TRANSWESTERN PIPELINE VERSUS MONSANTO?

A. AS I RECALL, YES.

Q. AND THE OUTBOARD MARINE, WAS THE STYLE OF THAT CASE OUTBOARD MARINE VERSUS MONSANTO?

A. AS I RECALL, YES.

Q. HAVE YOU PROVIDED ANY REGULATORY TESTIMONY ON BEHALF OF MONSANTO?

A. I'M NOT SURE. I'D HAVE TO SAY NO. I TALKED TO REGULATORY AGENCIES ON MONSANTO'S BEHALF, BUT I WOULDN'T CONSIDER IT TESTIMONY.

Q. HAVE YOU EVER TESTIFIED FOR ANY OTHER COMPANIES OTHER THAN MONSANTO?

A. YES, I HAVE.

Q. HAVE ANY OF THOSE -- THAT TESTIMONY DEALT WITH PCB'S?

A. NO, IT HAS NOT.

Q. HAS ANY OF THAT TESTIMONY DEALT WITH DIOXINS OR FURANS?

A. NO, IT HAS NOT.

THAT'S NOT TOTALLY CORRECT. LET ME CORRECT THAT

STATEMENT. IN MY CAPACITY AS A QA/QC OFFICER FOR OHM AT A SUPERFUND SITE IN LOCKHAVEN, PENNSYLVANIA -- THE DRAKE CHEMICAL SUPERFUND SITE -- I TESTIFIED ON BEHALF OF THE DEPARTMENT OF JUSTICE AND THE EPA ON FACTS CONCERNING THAT PARTICULAR REMEDIATION. IN THAT REMEDIATION, AS I RECALL, THE ATTORNEY ASKED ME SOME QUESTIONS WITH REGARD TO ONE OF THE CONSTITUENTS AT THAT SITE AND WHETHER OR NOT IT WAS A DIOXIN PRECURSOR. SO TO THAT EXTENT I HAVE TESTIFIED IN THE PAST RELATIVE TO DIOXINS; HOWEVER, THAT SUPERFUND CLEAN-UP WAS NOT A PCB CLEAN-UP. IT WAS -- INVOLVED SOME OTHER CONTAMINANTS.

Q. WHAT IS YOUR CURRENT RELATIONSHIP WITH MONSANTO?

A. I HAVE NO OFFICIAL RELATIONSHIP WITH MONSANTO WITH THE EXCEPTION OF PERIODICALLY, WHEN ASKED, PROVIDING MYSELF FOR DEPOSITIONS AND ALSO FOR SOME EXPERT WORK WHEN THEY ASK ME TO DO THAT RELATIVE TO PCB'S.

Q. WHAT'S YOUR FINANCIAL ARRANGEMENT IN THAT REGARD?

A. MY FINANCIAL ARRANGEMENT WITH MONSANTO IS THAT IF I'M ASKED TO DO EXPERT WORK, THEN I'M COMPENSATED FOR IT. IF IT'S APPEARING AS A FACT WITNESS, THEN I'M ONLY COMPENSATED FOR THE TIME REQUIRED TO GET THERE AND BACK AND THE EXPENSES ASSOCIATED WITH THE TRAVEL.

Q. AND WHAT ARE YOU COMPENSATED AS AN EXPERT?

A. MY HOURLY FEE AS AN EXPERT IS $250.00 AN HOUR.
Q. AND ABOUT HOW MANY HOURS HAVE YOU WORKED SO FAR ON THE ABERNATHY CASE?
A. ON THE ABERNATHY CASE I THINK I HAVE BILLED ABOUT -- MAYBE ON THE ORDER OF ABOUT $2,000.
Q. NOW, HAVE YOU BEEN ABLE TO USE SOME OF THE WORK ---
A. LET ME CORRECT THAT. I HAVEN'T BILLED ANYTHING FOR THE DYER CASE, ACTUALLY -- OR FOR THE ABERNATHY CASE. I'M A LITTLE CONFUSED ON THE ISSUE. IT COULD BE 2,000 OR IT COULD BE NOTHING. I DON'T THINK IT'S SIGNIFICANT.
Q. HAVE YOU BEEN ABLE TO -- WILL YOU BE ABLE TO USE SOME OF THE WORK THAT YOU'VE BILLED MONSANTO IN THE DYER CASE IN THIS CASE?
A. NO.
Q. AND WHAT IS IT EXACTLY THAT YOU DID IN THE DYER CASE?
A. THE DYER CASE IS THE PREVIOUS ONE. THIS IS THE ABERNATHY CASE; IS THAT CORRECT?
Q. CORRECT.
A. OKAY. I JUST WANTED TO MAKE SURE.
IN THE DYER CASE I'M AS A FACT WITNESS, SO THE ONLY REIMBURSEMENT FOR THAT WOULD BE FOR THE TIME TO GET TO WHEREVER I'M DEPOSED, FOR ANY EXPENSES -- AIRLINE TICKET, HOTEL, MEALS -- THAT I HAVE TO PAY FOR OUT

OF POCKET, AND FOR THE RETURN TIME. THE ACTUAL DEPOSITION TIME IS NOT REIMBURSABLE -- AT LEAST I DON'T CONSIDER IT.

Q. NOW, ARE YOU A FACT WITNESS FOR MONSANTO OR FOR THE PLAINTIFFS IN THAT CASE?

A. I AM A FACT WITNESS FOR MONSANTO.

Q. I BELIEVE WE'VE PREVIOUSLY MARKED AS PLAINTIFFS' EXHIBIT NUMBER 1 A COPY OF YOUR CV. IS THAT CORRECT?

A. THAT'S CORRECT.

Q. AND YOU HAVE THAT THERE IN FRONT OF YOU?

A. YES, I DO.

Q. AND THAT BASICALLY STATES THAT YOU RECEIVED A PH.D. FROM THE UNIVERSITY OF IOWA; IS THAT CORRECT?

A. THAT'S CORRECT.

Q. AND THAT WAS IN ANALYTIC AND ORGANIC CHEMISTRY?

A. THAT'S CORRECT.

Q. AND THAT YOU HAVE A BS FROM MICHIGAN STATE UNIVERSITY IN ANALYTICAL CHEMISTRY?

A. YES, I DO.

Q. AND AN ASSOCIATE OF SCIENCE -- IS THAT WHAT THAT IS, "A.S."?

A. THAT'S CORRECT.

Q. -- IN CHEMISTRY AND MATHEMATICS FROM THE UNIVERSITY OF MICHIGAN?

A. CORRECT.
Q. AS FAR AS YOUR PREVIOUS EMPLOYMENT IT LOOKS LIKE YOU WENT TO MONSANTO DIRECTLY OUT OF YOUR PH.D. PROGRAM. IS THAT RIGHT?
A. WHEN I LEFT GRADUATE SCHOOL, I WENT TO WORK FOR MONSANTO. YES, THAT'S CORRECT.
Q. AND SINCE YOU LEFT MONSANTO IT LOOKS LIKE YOU WENT TO AMF, WHICH IS A TOBACCO COMPANY. IS THAT CORRECT?
A. AMF, INCORPORATED -- THE -- AMF, THE INITIALS, ORIGINALLY STOOD FOR AMERICAN MACHINE AND FOUNDRY, AND ONE OF THE PRODUCTS THEY MANUFACTURED YEARS AND YEARS AGO WERE TOBACCO HANDLING EQUIPMENT. HOWEVER, AMF WAS A RATHER LARGE CONGLOMERATE, AND THAT WAS A VERY SMALL PORTION OF THE BUSINESS. BUT IT WAS -- IT DID HAVE TO DO WITH THE TOBACCO BUSINESS, YES.
Q. WHAT WAS YOUR POSITION WITH AMF?
A. THE INITIAL POSITION I HAD WITH AMF WAS IN STAMFORD, CONNECTICUT, AND I THINK IT STARTED IN 1979, AND I WAS MANAGER OF ANALYTICAL AND PROCESS CHEMISTRY FOR THE WORLD TOBACCO DIVISION.
Q. AND WHAT DID THE WORLD TOBACCO DIVISION DO?
A. THE WORLD TOBACCO DIVISION WAS PRIMARILY RESPONSIBLE FOR MANUFACTURING RECONSTITUTED TOBACCO AND THE RECONSTITUTED TOBACCO PROCESS THAT WAS USED TO

MANUFACTURE CIGARETTE FILLER, CIGAR BINDER, CIGAR WRAPPER, AND CIGAR FILLER FROM THE FINES AND OTHER -- - AND STEMS AND OTHER KINDS TOBACCO PRODUCTS THAT COULDN'T BE USED DIRECTLY.

Q. AND AS AN ANALYTICAL AND PROCESS CHEMIST WHAT DID YOU DO?

A. I WAS RESPONSIBLE FOR DEVELOPING THE ANALYTICAL METHODOLOGY FOR MONITORING THE QUALITY CONTROL OF THE PROCESS AND FOR DETERMINING WHAT CONSTITUENTS WERE ADDED, THAT THEY STAYED WHERE THEY WERE SUPPOSED TO BE, AND THAT THEY ENDED UP IN THE PRODUCT AND THOSE TYPES OF THINGS.

Q. AND WHAT WAS YOUR NEXT POSITION AT AMF?

A. I WAS MANAGER OF ANALYTICAL CHEMISTRY AND NON-TOBACCO RESEARCH FOR THE CUNO AND MICROFLAKE DIVISIONS.

Q. AND WHAT DID YOU DO AS MANAGER OF THAT DIVISION?

A. AS A NATURAL OFFSHOOT OF THE PROCESSING THAT WAS USED TO PREPARE TOBACCO SHEET -- WHICH WAS THE PRODUCT THAT WAS MADE FROM TOBACCO WASTE AND WHICH WAS EVENTUALLY THEN CONVERTED INTO WRAPPER, BINDER, AND FILLER FOR CIGARS AND CIGARETTES -- INVOLVED A LOT OF WORKING WITH NATURAL FIBERS AND CONVERTING THOSE FIBERS INTO A FORM THAT THEY COULD BE PUT BACK TOGETHER IN A FASHION THAT WOULD PRODUCE A USEABLE

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PRODUCT. WE EXTENDED THAT TECHNOLOGY INTO A NUMBER OF AREAS, INTO HIGHLY REFINED PULP AREAS TO PRODUCE FILTRATION MATERIALS. CUNO WAS A DIVISION OF AMF, INCORPORATED THAT DEALT SPECIFICALLY WITH FILTRATION MEDIA, AND IN FACT ONE OF THE THINGS THAT THEY MANUFACTURED WAS A HIGHLY REFINED PULP MEDIA THAT WAS CHARGED AND THAT'S USED AS AN ASBESTOS SUBSTITUTE, FOR THE FILTRATION OF FOODS, AND OTHER KINDS OR PRODUCTS. I WORKED ON THE DEVELOPMENT OF THOSE KINDS OF THINGS.

I ALSO WORKED ON THE DEVELOPMENT OF USING WASTE CHROME TANNED SCRAPS FROM LEATHER PROCESSING AND COMMUTING THOSE FIBERS INTO A USEABLE FORMAT THAT COULD BE PUT BACK TOGETHER TO PRODUCE AN ENGINEERED LEATHER PRODUCT THAT COULD BE USED FOR THINGS LIKE BASKETBALLS AND WALLETS AND SHOES AND BRIEFCASES AND THINGS OF THAT SORT. AMF ALSO OWNED A HEAD DIVISION AND THE VOIGHT (PHONETIC) DIVISION. THEY HAD HARLEY-DAVIDSON, BEN HOGAN. THEY HAD A LOT OF SPORTS INTERESTS. THAT RECONSTITUTED LEATHER PRODUCT HAD MANY OF THE PROPERTIES OF REAL LEATHER, WHICH IS A HIGHLY OVER-ENGINEERED PRODUCT, AND SO THESE WERE USED AS SUBSTITUTES IN A LOT OF THOSE PRODUCT AREAS.

Q. NEXT YOU WERE PROJECT MANAGER AND THE UNIT MANAGER,

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RESEARCH SPECIALIST, MATERIALS SCIENCE CENTER, CORPORATE ENGINEERING AND RESEARCH?

A. THAT'S CORRECT.

Q. WHAT DID YOU DO IN THAT POSITION?

A. IN THAT POSITION I MAINLY MOVED OUT OF THE -- AS A DIVISIONAL FUNCTION INTO A STAFF FUNCTION. I REPORTED TO A VICE PRESIDENT IN THE COMPANY AND PERFORMED THESE PROJECTS OF MINE OWN PLUS SOME OTHER ONES. AND WE ALSO DEVELOPED SOME TECHNIQUES FOR DEVELOPING PATHOGEN-ATTRACTING SURFACES USING NATURAL CELLULOSE FIBERS SO THAT WE COULD PRODUCE FABRICS THAT COULD BE USED FOR CURTAINS AND COULD BE USED FOR -- THAT DOCTORS WEAR WHEN THEY DO OPERATIONS AND FOR PATIENTS AND THINGS OF THAT SORT. THE MATERIALS WERE CHARGED IN SUCH A MANNER THAT THEY WOULD NATURALLY ATTRACT PATHOGENS, WHICH HAVE A CHARGE ON THEM, AND THEY WOULD RETAIN THE PATHOGENS. WE ALSO DEVELOPED TECHNIQUES FOR IMPREGNATING THOSE FIBERS WITH BACTERIA STATS THAT WOULD KILL THE PATHOGENS ONCE THEY WERE PUT ON THAT. WE DID A LOT OF TESTING WITH THAT, AND OUR HOPES WERE THAT WE COULD HAVE A NEW TECHNOLOGY FOR KEEPING PATHOGEN-BORNE DISEASES DOWN IN HOSPITALS AND THINGS OF THAT SORT. THAT'S PRIMARILY WHAT I DID IN THAT UNIT.

Q. I ASSUME NONE OF YOUR WORK AT AMF WAS -- INVOLVED

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PCB'S.

A. THAT'S CORRECT.

Q. DID ANY OF YOUR WORK AT AMF INVOLVE DIOXINS OR FURANS?

A. NO, IT DID NOT.

Q. IT LOOKS LIKE AFTER THAT YOU LEFT AMF AND WENT TO CHEMICAL WASTE MANAGEMENT. IS THAT CORRECT?

A. THAT'S CORRECT.

Q. WHY DID YOU LEAVE AMF?

A. AMF, INCORPORATED WAS A LARGE CONGLOMERATE THAT HAD EXTENDED ITSELF INTO A LOT OF AREAS THAT IT WASN'T OPERATING IN AN OPTIMAL FASHION. THERE WAS A HOSTILE TAKEOVER FROM OUTSIDE THAT WANTED TO PURCHASE THE COMPANY AND BASICALLY CONVINCED THE SHAREHOLDERS THAT THEY COULD DO A BETTER JOB OF OPERATING THE UNIT AND PROVIDING PROFIT FOR THE SHAREHOLDERS. THEY TOOK THE COMPANY OVER, AND THE CORPORATE RESEARCH UNIT WAS DISSOLVED, AND I STAYED ON UNTIL I FOUND A JOB -- TO COMPLETE PROJECTS FOR THE PEOPLE I WAS WORKING FOR UNTIL I FOUND A JOB WITH CHEMICAL WASTE MANAGEMENT.

Q. IT LOOKS LIKE FROM THEN ON UNTIL THE PRESENT THAT YOU'VE BEEN ASSOCIATED WITH COMPANIES OWNED OR PARTIALLY OWNED OR ASSOCIATED WITH WASTE MANAGEMENT, INC. IS THAT ABOUT RIGHT?

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A. THAT'S CORRECT.
Q. SO ALL THE REST OF THESE COMPANIES ARE IN SOME WAY RELATED TO WASTE MANAGEMENT; IS THAT CORRECT?
A. THAT IS CORRECT.
Q. NOW, JUST TALK A LITTLE BIT -- WHAT DID YOU DO AT CHEMICAL WASTE MANAGEMENT?
A. AT CHEMICAL WASTE MANAGEMENT I WAS ASKED TO COME ON BOARD TO THEIR CHICAGO AREA AND TO TAKE OVER THE CORPORATE ANALYTICAL LABORATORIES AND -- THEY NEEDED THE LABORATORY UPGRADED AND BROUGHT UP TO SPEED SO THAT IT WAS DOING QUALITY WORK AND WAS OPERATING IN AN EFFICIENT MANNER AND THAT IT WAS UP-TO-DATE, AND I TOOK ON THAT RESPONSIBILITY AND DID THAT.
Q. AND WAS THAT AN EPA-CERTIFIED LAB?
A. I DON'T BELIEVE THE EPA CERTIFIES CYBERTRACE.
Q. OKAY.
A. I -- LET ME SAY THIS. THE EPA DOES NOT CERTIFY LABORATORIES; HOWEVER, THAT LABORATORY DID PERFORM EPA METHODOLOGY AND ANALYZED SAMPLES USING METHODS THAT ARE AUTHORIZED BY THE EPA. I DON'T THINK YOU ASKED THAT QUESTION -- WELL, I DON'T KNOW.
Q. DID THAT LABORATORY EVER PERFORM SAMPLES FOR THE EPA?
A. THAT WAS -- THAT PARTICULAR LAB WAS NOT A CONTRACT LABORATORY PROGRAM. IT WAS NOT A CLIP LABORATORY,

SO WE DID NOT ANALYZE SAMPLES FOR THE EPA. THE DATA WAS USED FOR SUBMITTAL TO THE EPA AND WAS USED BY THE EPA TO MAKE DECISIONS, BUT WE DID NOT -- WE WERE NOT A CLIENT OF EPA.

Q. WHAT TYPES OF MATERIALS DID CHEMICAL WASTE MANAGEMENT ANALYZE?

A. THAT LAB WAS SPECIFICALLY DEDICATED TO ANALYZING AND CHARACTERIZING HAZARDOUS WASTE SAMPLES TO DETERMINE THE PROPER METHOD OF THEIR DISPOSAL, TO GENERATE THE INFORMATION THAT WOULD BE USED TO DETERMINE HOW IT SHOULD BE DISPOSED OF.

Q. WERE THERE ANY SPECIFIC CHEMICAL CONSTITUENTS THAT YOU WERE ANALYZING FOR?

A. YES.

Q. AND WHAT WERE THOSE?

A. ANY OF THE COMPOUNDS THAT ARE ON THE EPA HAZARDOUS CHEMICAL LIST.

Q. AND THAT WOULD INCLUDE PCB'S; IS THAT CORRECT?

A. YES, IT WOULD. YES, IT WOULD.

Q. HOW MUCH OF YOUR WORK AT CHEMICAL WASTE MANAGEMENT DURING THAT TIME PERIOD WOULD YOU SAY WAS RELATED TO ANALYZING PCB'S VERSUS OTHER HAZARDOUS MATERIALS?

A. PCB'S IS -- ARE -- AS COMPOUNDS ARE A SUITE OF A NUMBER OF HAZARDOUS CHEMICALS, AS YOU KNOW THAT, AND ALL SAMPLES THAT ARE -- IF YOU DON'T KNOW WHAT IT IS

WHEN YOU'RE SCREENING IT FOR THAT, YOU WOULD PROBABLY SCREEN IT FOR PCB'S AS WELL AS THE OTHER KINDS OF HAZARDOUS CHARACTERISTICS THAT THE EPA SCREENS FOR, SO A LARGE NUMBER OF SAMPLES WERE ANALYZED. OFF THE TOP OF MY HEAD I WOULD GUESS THAT PROBABLY 25 PERCENT OF THE SAMPLES THAT WENT THROUGH THE LABORATORY HAD TO DO WITH PCB ANALYSIS, BUT IT WASN'T SOLELY PCB ANALYSIS. THOSE WERE JUST ONE OF THE PARAMETERS THAT WOULD BE MEASURED ON THOSE SAMPLES.

Q. AND HOW MANY PEOPLE WORKED IN THAT LABORATORY WHEN YOU WERE THERE?

A. I THINK THERE WERE PROBABLY ON THE ORDER OF ABOUT 50, ON THE AVERAGE.

Q. AND WHAT WAS YOUR POSITION THERE?

A. THAT POSITION STARTED OUT AS MANAGER, YOU KNOW, OF THE ANALYTICAL CHEMISTRY OPERATIONS, AND AT ONE POINT IN TIME I WAS AT THE SENIOR DIRECTOR LEVEL.

Q. AND THEN IT LOOKS LIKE YOU WENT TO WASTE MANAGEMENT INTERNATIONAL IN THE NETHERLANDS. IS THAT CORRECT?

A. THAT'S CORRECT.

Q. WHY DID YOU MOVE THERE?

A. I WAS OFFERED AN OPPORTUNITY -- WASTE MANAGEMENT DECIDED TO EXPAND ITS OPERATIONS -- CHEMICAL WASTE MANAGEMENT -- IN THE EUROPEAN COMMUNITY, AND THEY

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PURCHASED A COMPANY CALLED AFVALSSTOFFEN TERMINAL MOERDIJK -- ATM -- WAS THE NAME OF THE COMPANY IN MOERDIJK, HOLLAND. THEY NEEDED SOMEBODY TO GO OVER AND SET UP THE LABORATORY AND REALLY MAKE IT DO WHAT WE DID IN THE UNITED STATES, AND IT WAS OUR FIRST ENTRY INTO THE EUROPEAN COMMUNITY, AND SO THEY ASKED ME IF I WOULD CONSIDER THAT ASSIGNMENT. IT LOOKED REAL EXCITING TO ME AND REAL CHALLENGING, AND SO I TOOK ON THE ASSIGNMENT.

Q. AND THEN IT LOOKS LIKE YOU WENT BACK TO CHEMICAL WASTE MANAGEMENT FROM '89 TO '90; IS THAT CORRECT?

A. THAT'S CORRECT.

Q. AND WAS YOUR POSITION JUST OVER IN THE NETHERLANDS?

A. MY -- THE OBJECTIVE OF WHAT I WAS DOING OVER THERE, I HAD COMPLETED THAT. I HAD DESIGNED THE LABORATORY FOR THEM. WE HAD STAFFED IT. WE HAD TRAINED THE PEOPLE, BOUGHT THE APPROPRIATE INSTRUMENTATION, AND GOT IT UP TO OPERATING AT THE LEVEL OF EXPERTISE THAT WE WANTED IT TO WITH THE PROPER QUALITY AND QUALITY ASSURANCE. AT THAT POINT IN TIME I CAME BACK TO THE UNITED STATES AND BEGAN AGAIN WORKING FOR CHEM WASTE MANAGEMENT SINCE I WAS ONLY BEING LOANED TO THE EUROPEAN LABORATORY SYSTEM.

Q. THEN YOU WENT TO CHEM NUCLEAR ENVIRONMENTAL SERVICES HERE IN GREENVILLE, SOUTH CAROLINA; IS THAT CORRECT?

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A. THAT'S CORRECT.

Q. WHY DID YOU MAKE THAT MOVE?

A. THE DEPARTMENT OF ENERGY HAD A LOT OF MIXED WASTE ISSUES. MIXED WASTE IS DEFINED AS WASTE THAT HAS CHEMICALLY HAZARDOUS CHARACTERISTICS AS WELL AS RADIOACTIVE HAZARDOUS CHARACTERISTICS, AND BEING THAT KIND OF A WASTE IT NEEDS TO BE TREATED BOTH AS A CHEMICAL WASTE AND AS A RADIOACTIVE WASTE. SO THE DEPARTMENT OF ENERGY WAS IN THE PROCESS OF BEGINNING TO DEVELOP THE PROGRAMS FOR REDMEDIATING THE D.O.E. RADIOACTIVE PROCESSING SITES AND -- FOR SAVANNAH RIVER, WHICH IS THE CLOSEST ONE AROUND HERE, FERNALD, PANTEX, AND A NUMBER OF OTHERS. OUR COMPANY WAS INTERESTED IN PARTICIPATING IN THE REMEDIATION PORTION OF IT AND IN FACT ACTIVELY BID ON THE ENVIRONMENTAL RESTORATION CONTRACTS. AS PART OF THAT THEY ASKED US TO PUT TOGETHER -- WE DECIDED WE WOULD PUT TOGETHER AN ENGINEERING AND AN ANALYTICAL LABORATORY THAT WAS QUALIFIED TO HANDLE HIGH LEVEL RADIOACTIVE SAMPLES AS WELL AS CHEMICALLY HAZARDOUS SAMPLES. WE DID THAT. WE CAME TO GREENVILLE, AND WASTE MANAGEMENT PURCHASED ENRIGHT ENVIRONMENTAL CONSULTING LABORATORIES AND SIRRINE ENVIRONMENTAL CONSULTING LABORATORIES. I TOOK OVER THE ANALYTICAL OPERATIONS OF THOSE TWO LABORATORIES

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OR BUSINESSES, AND WE HARVESTED THOSE LABORATORIES AND RETRAINED THE PEOPLE, AND WE BUILT A 10-MILLION-DOLLAR FACILITY AT CLEMSON RESEARCH PARK THAT WAS QUALIFIED AND CAPABLE OF HANDLING THOSE KINDS OF FOLKS. WE TRANSFERRED EVERYBODY DOWN THERE AND THEN STARTED UP THE OPERATION OF ANALYTICALLY CHARACTERIZING SAMPLES FROM THE D.O.E. WASTE SITES AND DEVELOPING THE ENGINEERING TECHNOLOGY TO TREAT THOSE SAMPLES -- TO TREAT THE SAMPLES AND, IN TURN, THE WASTE AT THE SITES.

Q. AND I ASSUME THOSE SITES DID INVOLVE PCB'S ALSO. IS THAT CORRECT?

A. YES, SIR, THEY SURE DID.

Q. AS WELL AS OTHER NUCLIDES?

A. ABSOLUTELY.

Q. AND THEN IT LOOKS LIKE IN 1992 YOU WENT TO CHEMICAL WASTE MANAGEMENT IN ANDERSON, SOUTH CAROLINA. WHY DID YOU MAKE THAT MOVE?

A. ACTUALLY IT'S THE SAME THING. I HAD COMPLETED -- MY JOB WAS TO DESIGN THE FACILITY, TO WORK WITH THE ARCHITECTS, TO WORK -- AND TO GET IT CONSTRUCTED, TO TRAIN THE PEOPLE IN HANDLING RADIOACTIVE MATERIALS AND OTHER KINDS OF THINGS, TO GET ALL OF THE QUALITY CONTROL AND THE HEALTH AND SAFETY AND EVERYTHING UP IN THE FACILITY. AND THEN ONCE THAT WAS OPERATIONAL

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WE TURNED IT OVER TO OTHER FOLKS. AND THEN AT THAT POINT IN TIME I STAYED ON TO HELP IN OTHER AREAS WITH THE OPERATION OF THE FACILITY UNTIL I COULD FIND ANOTHER ASSIGNMENT WITHIN THE COMPANY THAT WAS SUITABLE FOR ME AND THAT KIND OF THING.

Q. NOW, IS CHEM NUCLEAR ENVIRONMENTAL SERVICES, IS THAT STILL A COMPANY?

A. NO. FOR WHATEVER BUSINESS PURPOSES, WHEN THEY INITIALLY STARTED OUT WHEN I MOVED TO GREENVILLE, THEY INCORPORATED US UNDER CHEM NUCLEAR LABORATORY SERVICES, AND THEN -- AND THAT WAS ASSOCIATED WITH THE CHEM NUCLEAR ENVIRONMENTAL SERVICES, WHICH IS LOCATED IN THE STATE. THEY CHANGED NAMES, BUT, YOU KNOW, IT WAS BASICALLY THE SAME JOB EVEN THOUGH THEY CHANGED THE COMPANY NAMES.

Q. BUT THAT COMPANY IS STILL AROUND TODAY?

A. YES, IT IS.

Q. AND ARE THEY DOING WORK FOR THE D.O.E.?

A. YES, I BELIEVE THEY STILL DO.

Q. YOU DON'T HAVE ASSOCIATION ---

A. NO, I DO NOT.

Q. --- WITH THEM ANYMORE?

A. NO, I DO NOT.

Q. ALL RIGHT. AND YOU -- WHAT DID YOU DO AT CHEMICAL WASTE MANAGEMENT IN ANDERSON, SOUTH CAROLINA?

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A. I OVERSAW THE EFFORTS IN TERMS OF THE MIXED WASTE ANALYTICAL PROGRAMS. AND, LIKE I SAID, IT WAS A TRANSITION POSITION FOR ME WHERE I BEGAN TO LOOK THROUGH THE COMPANY -- ONCE I COMPLETED THAT ASSIGNMENT I LOOKED THROUGH THE COMPANY FOR ANOTHER ASSIGNMENT.

Q. WHAT DO YOU MEAN BY "MIXED WASTE"?

A. WELL, MIXED WASTE, AS I -- WELL, MAYBE I DIDN'T SAY EARLIER. IT'S HAZARDOUS WASTE OR WASTE THAT HAS BOTH RADIOACTIVE HAZARD ASSOCIATED WITH IT AND CHEMICAL HAZARD ASSOCIATED WITH IT.

Q. DOES WASTE MANAGEMENT HAVE A FACILITY TO DISPOSE OF MIXED WASTES?

A. NO.

Q. WHAT WOULD YOU ALL DO WITH THE SAMPLES, OR WHAT WAS THE PURPOSE FOR YOU ANALYZING THOSE TYPE OF SAMPLES?

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION.

DIRECT EXAMINATION RESUMED BY MR. FELL:

Q. GO AHEAD AND ANSWER.

A. THE PURPOSE THAT WE HAD FOR ANALYZING THE SAMPLES WAS, ONE, DETERMINING IF IT TRULY WAS HAZARDOUS EITHER FROM A RADIOACTIVE VIEWPOINT OR FROM A CHEMICAL VIEWPOINT, AND, IF IT WAS, HOW WAS IT HAZARDOUS, BECAUSE THERE ARE DIFFERENT KINDS OF

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TREATMENT, AS YOU KNOW, THAT ARE DICTATED FOR DIFFERENT KINDS OF HAZARDS IN THESE KINDS OF MATERIALS. AND THEN WE WOULD TRANSFER THAT INFORMATION OVER TO THE ENGINEERING FOLKS OR THE PROCESS FOLKS, AND THEN THEY WOULD DECIDE WHAT NEEDED TO BE DONE AND HOW IT NEEDED TO BE DONE.

Q. SO BASICALLY YOU ALL WERE JUST A LABORATORY DOING WORK FOR REMEDIATION EXPERTS; IS THAT CORRECT?

A. THAT'S CORRECT. WE CHARACTERIZED THE WASTE AND THEN DEVELOPED BENCH-SCALE TREATMENT PROCESSES THAT COULD BE USED TO TREAT THE WASTE IN A FASHION THAT IT NEEDED TO BE TREATED.

Q. NOW, WERE YOU INVOLVED IN THE DEVELOPMENT OF PLANS TO TREAT THE WASTE?

A. ONLY TO THE EXTENT THAT ANALYTICAL CHEMISTRY WAS INVOLVED.

Q. OKAY. IT LOOKS LIKE THEN YOU WENT TO RUST REMEDIATION SERVICES IN ANDERSON, SOUTH CAROLINA. WHY DID YOU MAKE THAT MOVE?

A. WELL, IT WASN'T SO MUCH THAT I MADE THE MOVE AS THAT THE COMPANY MADE THE MOVE. THE COMPANY PURCHASED RUST AND THEN RENAMED US RUST REMEDIATION SERVICES, AND THAT'S ALL THAT REALLY REFLECTS HERE.

Q. AND YOUR WORK THERE WAS AGAIN IN AN ANALYTICAL LABORATORY; IS THAT CORRECT?

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A. CORRECT.

Q. DOING THE SAME TYPE OF WORK YOU DID IN ANDERSON AT CHEMICAL WASTE MANAGEMENT?

A. CORRECT.

Q. AND YOU HELD ESSENTIALLY THE SAME POSITION; IS THAT CORRECT?

A. LET ME CLARIFY THIS A LITTLE. I'M LOOKING AT THE RESUME. I ALSO AT THAT TIME BEGAN TO PROVIDE SUPPORT FOR OUR THERMAL TREATMENT FACILITIES. WE HAD A DIVISION WITH ABOUT 2,000 FOLKS IN IT THAT THEIR MISSION IN LIFE WAS TO DEVELOP TREATMENT TECHNOLOGIES FOR THE REMEDIATION OF WASTE, AND I BEGAN TO PROVIDE SUPPORT FOR THOSE FOLKS OUT OF THE TECHNICAL CENTER USING MY ANALYTICAL EXPERTISE. AND I PROVIDED SUPPORT FOR ONE OF THEIR PROJECTS THAT THEY WERE HAVING A LOT OF PROBLEMS DOING AIR-MONITORING WITH AND STRAIGHTENED IT AROUND, AND THEY ACTUALLY ASKED IF I'D BE INTERESTED IN WORKING FOR THEM RATHER THAN WORKING FOR THEM OUT OF THE TECHNICAL CENTER AND BILLING THEM THAT WAY. THEY HAD A NUMBER OF PROJECTS THAT THEY DIDN'T WANT TO HAVE ISSUES WITH, THE ANALYTICAL PORTION OF IT, SO THEY FELT THEY NEEDED SOMEBODY WHO KNEW ANALYTICAL CHEMISTRIES AND COULD DO IT CORRECTLY UP-FRONT, SO THEY WOULDN'T HAVE TO CORRECT IT AFTERWARDS, AND SO

THEY OFFERED ME A POSITION. AND AT THAT POINT IN TIME I MOVED OVER INTO THE RUST -- WHAT WAS REALLY CALLED RUST REMEDIATION SERVICES, AND IT WAS A THERMAL OPERATIONS.

Q. AND WHEN YOU SAY "THERMAL," YOU MEAN BURNING OF WASTES?

A. WHAT I MEAN IS THAT THERE -- THERMALLY SPEAKING THERE'S A COUPLE OF GENERAL TECHNIQUES THAT ARE USED. ONE CAN BE THERMAL EXTRACTION, WHERE THE CONSTITUENTS IN QUESTION ARE VAPORIZED FROM THE MATRIX AND THEN COLLECTED AND THEN DISPOSED OF OR TREATED FURTHER. THE OTHER IS WHERE THE MATERIALS ARE DIRECTLY INCINERATED TO MINERAL SALTS AND CARBON DIOXIDE AND THAT KIND OF THING. SO THAT'S WHAT'S MEANT BY THERMAL TREATMENT.

Q. AND YOUR EXPERTISE IN THAT AREA WAS, AGAIN, NOT IN DESIGNING THOSE SYSTEMS BUT IN DESIGNING ANALYTICAL TECHNIQUES TO MEASURE WHAT WAS BEING -- WHETHER IT WAS -- THE TREATMENT WAS EFFECTIVE OR WHAT NEEDED TO BE TREATED; IS THAT CORRECT?

A. THAT'S PARTIALLY CORRECT. IT'S VERY CORRECT THAT THE ONLY THING I WAS INVOLVED WITH WERE THE ANALYTICAL CHEMISTRIES AND THE MONITORING OF THE UNITS. I ALSO GOT INTO THE AREA OF AIR-MONITORING WHERE WE HAD PERIMETER AIR-MONITORINGS ON THE SITES

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WHERE THE REMEDIATION IS ACTUALLY TAKING PLACE. AND THE PERIMETER AIR MONITORS ARE SET UP TO MONITOR FOR CERTAIN KINDS OF CONSTITUENTS TO MAKE SURE THAT THERE'S NO CHEMICAL TRESPASS OCCURRING OFF THE SITE DUE TO OUR ACTIVITIES. SO AT THAT POINT IN TIME I MOVED OVER INTO ANOTHER AREA OF ANALYTICAL CHEMISTRY, AND THAT'S AIR-MONITORING.

Q. OKAY. NOW, WHEN YOU SAY YOU MOVED TO AIR-MONITORING, YOU WENT OUT, ACTUALLY, IN THE FIELD AND WOULD COLLECT AIR-MONITORING OR DESIGN AIR-MONITORING PROGRAMS?

A. WHAT I DID INITIALLY WAS -- THERE HAD BEEN A SYSTEM THAT HAD BEEN DESIGNED BY A SUBCONTRACTOR THAT HAD SEVEN AIR-MONITORING UNITS ON A PERIMETER OF A THERMAL OPERATION IN TEXAS, AND IT WASN'T FUNCTIONING TO THE SATISFACTION OF US, OUR CLIENT, OR THE EPA. SO I WENT DOWN THERE AND TOOK A LOOK AT WHAT I THOUGHT WERE THE ISSUES WITH IT AND DEVELOPED A PLAN OF ACTION TO CORRECT THOSE ISSUES, CORRECTED THOSE ISSUES, AND AFTER THAT WAS DONE THAT'S WHEN THEY DECIDED PERHAPS THEY NEEDED SOMEBODY LIKE ME AROUND PERMANENTLY, AND THAT'S WHEN THEY OFFERED ME A JOB. SO THAT'S WHAT I MEAN BY THAT.

Q. NOW, WHEN YOU WERE INVOLVED WITH ALL THE OTHER CHEMICAL WASTE MANAGEMENTS OR THE MONSANTO -- NOT

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MONSANTO. LET'S JUST STICK WITH WASTE MANAGEMENT GROUPS. WERE YOU INVOLVED IN ACTUAL SAMPLE TAKING OR JUST THE ANALYSIS OF SAMPLES WHICH YOU WERE PROVIDED?

A. THE OPERATIONS THAT I RAN COULD BE INVOLVED IN ANY OR ALL OF THOSE ASPECTS. MOST OF MY ACTIVITIES AT WASTE MANAGEMENT WERE AT A MANAGEMENT LEVEL WHERE I DIRECTED PEOPLE TO DO THINGS AND WAS BASED ON MY KNOWLEDGE OF HOW THEY WERE SUPPOSED TO BE DONE AND THAT KIND OF STUFF. AS DIRECTOR OF A LARGE FACILITY I DIDN'T VERY FREQUENTLY GO OUT AND ACTUALLY GET SAMPLES. NOW, WHEN I WENT OVER INTO RUST REMEDIATION, IT WAS MORE OF A SINGLE OPERATION WHERE I PUT THE TEAMS TOGETHER, AND I TRAINED THEM HOW TO DO STUFF, AND I MADE SURE THEY DID IT IN THE FIELD CORRECTLY. AT WHICH POINT TIME, ONCE I WAS SURE THEY WERE DOING IT CORRECTLY, THEN I MONITORED THEM TO MAKE SURE THAT THEY CONTINUED TO DO IT CORRECTLY, AND THEN I TOOK THE INFORMATION THAT THEY GENERATED AND CREATED THE REPORTS THAT WENT TO THE AGENCY.

Q. WHAT TYPE OF ENVIRONMENTAL MEDIA DID YOU MONITOR FOR WHEN YOU WORKED FOR RUST?

A. THE PRIMARY ONE INITIALLY WHEN I WORKED FOR RUST WAS THE AIR-MONITORING.

Q. WHAT CONSTITUENTS WERE YOU MONITORING FOR?

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A. AT THAT POINT IN TIME, AS I RECALL, WE WERE MONITORING THE AIR FOR SEVEN CONSTITUENTS, AND THEY RANGED FROM VINYL CHLORIDE TO CHLOROETHYL ETHER. WE HAD SEVEN UNITS WITH SMALL GC'S IN THEM THAT OPERATED CONTINUOUSLY AT DIFFERENT POINTS AROUND THE PERIMETER OF A 56-ACRE SITE. THEY ANALYZED A SAMPLE EVER 15 MINUTES. INFORMATION RELATIVE TO THOSE SEVEN CONSTITUENTS WAS -- WENT INTO A COMPUTER WHICH ANALYZED IT AND THEN RADIOTELEMENTRIED (PHONETIC) IT TO A CENTRAL STATION. THE CENTRAL STATION THEN TOOK THAT INFORMATION AND COMBINED IT WITH METEOROLOGICAL DATA THAT WAS COMING FROM A METEOROLOGICAL STATION THAT WE HAD AND DETERMINED THE UPWIND/DOWNWIND CONCENTRATIONS OF THE CONSTITUENTS; AND IF ANY OF THEM WENT ABOVE CERTAIN LEVELS AT THE PERIMETERS, THEY ALARMED AND CAUSED US TO TAKE CERTAIN KINDS OF ACTIONS TO PREVENT RELEASE OF THE MATERIALS.

Q. NOW, DID YOU DESIGN THE COMPUTER PROGRAM FOR THE AIR MODEL?

A. NO, BUT I HAD A SUBCONTRACTOR THAT DESIGNED IT TO MY SPECIFICATIONS.

Q. NOW, WAS THAT A PROGRAM THAT WAS IN EXISTENCE THAT THEY MODIFIED, OR WAS THAT SOMETHING THAT THEY CAME UP WITH FROM SCRATCH?

A. THIS PARTICULAR APPLICATION WAS ONE OF THE FIRST

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ONES, AND IT WAS PRETTY MUCH FROM SCRATCH, ALTHOUGH A LOT OF THE ALGORITHMS THAT ARE USED IN ALL SORTS OF COMPUTER PROGRAMS ARE NOT NECESSARILY INVENTED EACH TIME.

Q. DO YOU CONSIDER YOURSELF TO BE AN EXPERT IN AIR DISPERSION?

A. I AM NOT AN AIR MODELER. I'M AN AIR MONITOR. HOWEVER, I DO WORK WITH AIR MODELERS, AND A LOT OF TIMES I'VE WORKED WITH THEM AND BROUGHT REALITY TO THE SITUATION. THEY DO THEORETICAL CALCULATIONS ABOUT HOW CONSTITUENTS MOVE IN THE AIR, AND I THEN CAN DESIGN TECHNIQUES TO USE TO MEASURE TO SEE IF THEY REALLY DO MOVE IN THE AIR THAT WAY, SO I'VE WORKED AS PART OF A TEAM THAT HAS TO DO WITH AIR-MONITORING FREQUENTLY.

Q. NOW, YOUR AIR-MONITORING AT RUST, DID IT EVER INVOLVE AIR-MONITORING FOR PCB'S?

A. NO, IT DID NOT.

Q. WHAT ABOUT DIOXINS OR DIBENZOFURANS?

A. YES.

Q. AND WHERE DID IT INVOLVE THE MONITORING FOR DIBENZOFURANS OR DIOXINS?

A. I'M TRYING TO REMEMBER IF RUST -- YEAH. I HAVE ANOTHER SUPERFUND SITE THAT I PROVIDE ANALYTICAL CHEMISTRY TECHNOLOGIES FOR AND QA/QC. THE NAME OF

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THAT -- IT'S A DRAKE CHEMICAL SUPERFUND SITE. IT'S LOCATED IN LOCKHAVEN, PENNSYLVANIA. IT'S BEEN AROUND -- IT'S BEEN A PROJECT ASSOCIATED WITH THE COMPANY SINCE ABOUT 1993. AND WE HAVE AIR-MONITORING THERE, AND ONE OF THE CONSTITUENTS THAT WE MONITOR IN THE COMMUNITY FOR ARE FURANS AND DIOXINS.

Q. WHAT IS THE SOURCE OF THE FURANS AND DIOXINS?

A. THERE ACTUALLY IS NO SOURCE OF THE FURANS AND DIOXIN. WE'RE MONITORING THE COMMUNITY TO INSURE THAT THE INCINERATOR -- TO ASSURE THE PUBLIC AND EVERYBODY ELSE THAT THE INCINERATOR THAT'S PROCESSING THE SOIL AT THAT SITE IS NOT PRODUCING THOSE MATERIALS AND PUTTING THEM INTO THE ENVIRONMENT. SO WE'RE VERIFYING THAT WITH THESE MONITORING SYSTEMS.

Q. SO WILL I ASSUME THEN THAT ALL YOUR SAMPLES THAT YOU'VE ANALYZED FOR FURANS AND DIOXINS HAVE COME BACK NON-DETECT?

A. NO, THAT'S NOT TRUE AT ALL.

Q. THEN I WILL ASSUME THAT THE LEVELS OF FURANS AND DIOXINS HAVE COME BACK BELOW LEVELS OF CONCERN FROM THE EPA STANDPOINT?

A. THAT'S CORRECT. AND AS YOUR PROBABLY KNOW -- OR IF YOU DON'T -- DIOXINS AND FURANS ARE FAIRLY

UBIQUITOUS CONTAMINANTS, AND THEY COME FROM A LOT OF BURNING OF POLYVINYL CHLORIDE AND THINGS OF THIS SORT. AND IN FACT ONE OF THE PRIMARY SOURCES OF DIOXINS AND FURANS THAT WE SEE AS BACKGROUND IN OUR ENVIRONMENT TODAY COME FROM HOSPITAL INCINERATORS.

Q. NOW, WERE YOU ABLE TO DETERMINE FROM YOUR SAMPLING WHETHER THE INCINERATOR INCREASED THE LEVEL OF FURANS AND DIOXINS IN THE AMBIENT AIR SURROUNDING THE INCINERATOR?

A. YES.

Q. AND DID IT IN FACT INCREASE THE LEVEL?

A. NO.

Q. WHAT SAMPLING METHODS DID YOU USE TO ANALYZE FOR FURANS AND DIOXINS IN THE AMBIENT AREA?

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION.

WITNESS ANSWERS:

A. THE SAMPLING PROCEDURES THAT ARE USED ARE STANDARD ENVIRONMENTAL PROTECTION AGENCY METHODOLOGY. THEY ARE THE SAME METHODS THAT ARE USED TO ANALYZE FOR A GENERAL CLASS OF COMPOUNDS CALLED SEMI-VOLATILE ORGANIC COMPOUNDS. IT INVOLVES DRAWING A HIGH VOLUME OF AIR THROUGH A CONTINUOUS SAMPLER, AND THE SAMPLER CONSISTS OF A QUARTZ FIBER FILTER ON TOP OF POLYURETHANE FOAM FOAM-PUFF CARTRIDGE. AND THEN AT

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THE END OF DRAWING THE AIR THROUGH THOSE SAMPLES THAT MATERIAL IS SHIPPED TO THE LABORATORY, AND THE LABORATORY ANALYZES THE FILTER AND THE POLYURETHANE FOAM FOR THE CONSTITUENTS IN QUESTION.

Q. IS IT YOUR LAB THAT ANALYZES THOSE SAMPLES?

A. NO. THE LABORATORY IN THIS PARTICULAR INSTANCE IS MIDWEST RESEARCH INSTITUTE. IT'S AN INDEPENDENT CONSULTING LABORATORY.

Q. AND IS YOUR -- DO YOU HAVE A LAB AT RUST REMEDIATION SERVICES?

A. I DON'T HAVE A -- WE DON'T HAVE AN INTERNAL COMPANY LABORATORY THAT WE USE FOR ANALYSIS.

Q. ANY OTHER AIR-MONITORING AT RUST THAT INVOLVED DIOXINS OR FURANS?

A. THE ONLY OTHER WOULD BE MANDATORY STACK SAMPLING, AND THAT'S WHEN THE STACK FROM THESE UNITS IS MONITORED FOR DIOXINS. I'VE BEEN PRESENT WHEN THAT'S DONE TO VERIFY THAT IT'S DONE CORRECTLY AND ANALYZED THE -- REVIEWED AND VERIFIED THAT THE INFORMATION WAS ANALYZED CORRECTLY AND REPORTED CORRECTLY.

Q. AND IS THIS THE SAME FACILITY WE'RE TALKING ABOUT AS FAR AS ---

A. YES, IT IS.

Q. --- PERIMETER AIR-MONITORING?

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A. THAT'S CORRECT.

Q. OKAY. THEN IT LOOKS LIKE YOU WENT FROM RUST TO OHM REMEDIATION SERVICES CORP. WHY DID YOU MAKE THAT MOVE?

A. WELL, AGAIN, JUST AS I WENT FROM WASTE MANAGEMENT TO CHEM WASTE MANAGEMENT TO WASTE MANAGEMENT INTERNATIONAL TO CHEM NUCLEAR TO CHEM WASTE MANAGEMENT TO RUST TO OHM -- I DIDN'T MOVE ANYWHERE. THE RUST THERMAL OPERATIONS WERE TRADED TO OHM FOR 40 PERCENT OF THEIR STOCK AND SOME BOARD SEATS. IT WAS -- SO AT THAT POINT IN TIME, WHEN WE USED TO BE RUST, WE UNDERWENT A NOVATION AND BECAME OHM REMEDIATION SERVICES CORP.

Q. AND YOU'RE STILL EMPLOYED BY THEM TODAY?

A. NO, ACTUALLY I'M NOT. OHM -- AT THE END OF LAST YEAR OHM REMEDIATION SERVICES CORPORATION WAS PURCHASED BY THE I.T. GROUP. ORIGINALLY IT WAS CALLED INTERNATIONAL TECHNOLOGIES. THEY'VE RECENTLY UNDERGONE A NOVATION THEMSELVES AND CALL THEMSELVES NOW THE I.T. GROUP. SO I'M NOW PART OF I.T. CORPORATION.

Q. NOW, IS I.T. CORPORATION IN ANY WAY AFFILIATED WITH WASTE MANAGEMENT?

A. ONLY THAT THEY'RE IN -- NO. THEY ARE NOT. NO.

Q. IT ALSO LOOKS LIKE CONCURRENT WITH YOUR WORK FROM --

SINCE YOU MOVED TO -- MAYBE NOT SINCE YOU MOVED -- SINCE 1992 -- SCRATCH THAT. SINCE 1992 YOU HAVE OPERATED A COMPANY, ANALYTICAL CHEMISTRY CONSULTING SERVICES - ACCS. IS THAT CORRECT?

A. THAT'S CORRECT.

Q. IS THAT YOUR OWN PERSONAL COMPANY?

A. YES.

Q. AND IS THAT THE COMPANY YOU DO CONSULTING WORK FOR OTHER COMPANIES?

A. THAT'S CORRECT.

Q. WHAT ARE YOUR -- WHAT TYPE OF CONSULTING SERVICES DO YOU PROVIDE AT ANALYTICAL CHEMISTRY CONSULTING SERVICES?

A. PRIMARILY WHEN PEOPLE HAVE A LABORATORY TO GENERATE INFORMATION FOR THEM IF THEY HAVE SOME CONCERNS ABOUT THE DATA NOT BEING GENERATED CORRECTLY OR IF THEY WANT SOMEBODY TO VERIFY THAT THE DATA HAS BEEN GENERATED CORRECTLY, THEY CAN ASK ME TO DO THAT KIND OF THING. AND WHEN I DO THAT KIND OF THING, I GIVE THEM A LIST OF WHAT I NEED FROM THE LABORATORY TO PROVIDE, AND THE LABORATORY PROVIDES THE RAW DOCUMENTATION. I CAREFULLY REVIEW THE RAW DOCUMENTATION TO MAKE SURE THAT ALL THE QUALITY CONTROL/QUALITY ASSURANCE IS MET THAT'S REQUIRED IN THE EPA METHODOLOGY: HOLDING TIMES, THAT THE

CONTINUING CALIBRATION CURVES ARE CORRECT, AND THOSE KINDS OF THINGS. AND THEN AFTER I PROVIDE THE CLIENT BACK A REPORT THAT SAYS WHETHER OR NOT THE DATA IS DEFENSIBLE AND WHETHER OR NOT IT CAN BE USED FOR WHAT IT'S INTENDED TO BE USED FOR.

Q. HAVE YOU -- HAS ANALYTICAL CHEMISTRY CONSULTING SERVICES -- IS THAT THE COMPANY THAT'S BEEN RETAINED IN THIS CASE?

A. FOR THE EXPERT PORTION, YES.

Q. THE OTHER PORTION WOULD JUST BE A FACT WITNESS; IS --

A. THAT'S CORRECT.

Q. --- THAT CORRECT?

A. THAT'S CORRECT.

Q. THERE IS NO OTHER PORTION THAT I SHOULD BE CONCERNED ABOUT?

A. NO. I DIDN'T MEAN TO CONFUSE YOU, AND THAT'S WHAT I MEANT BY THAT. YOU WERE CORRECT IN STATING THAT.

Q. ANY OTHER EMPLOYMENT THAT'S NOT REFLECTED, OTHER THAN MONSANTO, THAT WE HAVEN'T DISCUSSED?

A. NO, NOT REALLY.

BY MR. FELL:

WHY DON'T WE TAKE A LITTLE BIT OF BREAK.

(SHORT BREAK)

DIRECT EXAMINATION RESUMED BY MR. FELL:

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Q. WE HAD TALKED ABOUT YOUR AIR-MONITORING PROGRAM THAT YOU SET UP FOR THE SUPERFUND SITE, I BELIEVE, IN -- THE DRAKE SUPERFUND SITE, IS THAT CORRECT? WAS THAT ---

A. YES.

Q. --- THE AIR-MONITORING?

IS THAT THE ONLY AIR-MONITORING SITE THAT YOU'VE WORKED ON?

A. NO. THE ONE THAT I MENTIONED EARLIER WAS IN HOUSTON, TEXAS.

Q. THE ONE THAT YOU'RE DOING THE FENCE-LINE CONTINUOUS MONITORING; IS THAT CORRECT?

A. THAT WAS ONE OF -- YES.

Q. BUT THAT DID NOT INVOLVE FURANS AND DIOXINS?

A. NO, IT DID NOT.

Q. OR PCB'S?

A. THAT'S CORRECT. IT INVOLVED THE SEVEN CONSTITUENTS THAT I MENTIONED EARLIER.

Q. OTHER THAN THE DRAKE SUPERFUND SITE HAVE YOU BEEN INVOLVED IN ANY OTHER AIR-MONITORING PROGRAMS?

A. NO.

Q. THEN I ASSUME THAT YOU HAVEN'T BEEN INVOLVED IN ANY AIR-MONITORING PROGRAMS FOR THE DETECTION OF PCB'S. IS THAT CORRECT?

A. THAT'S CORRECT.

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Q. OKAY.

A. THAT'S ACTUALLY NOT CORRECT. LET ME BACK UP. I NEED TO -- I SHOULD'VE TAKEN A LITTLE BIT MORE TIME TO THINK ON THAT.

IN THE QUALIFICATION OF THIS PARTICULAR THERMAL UNIT WE DID A LOT OF STACK SAMPLING FOR POLYCHLORINATED BIPHENYLS TOO. YOU'RE GENERALLY REQUIRED TO SURVEY THE STACK FOR ALL OF THE DIFFERENT KINDS OF CHEMICAL CONSTITUENTS THAT MIGHT BE THERE, AND SO PCB ANALYSIS WAS DONE ON STACK SAMPLES AND I WAS PART OF THAT. THAT'S NOT EXACTLY THE SAME AS AIR-MONITORING, BUT IT IS AIR-MONITORING. IT'S JUST AIR-MONITORING RIGHT AT THE SOURCE AND DETERMINING THAT IT IS NOT A SOURCE OF THOSE MATERIALS.

Q. AND IN THAT YOU DON'T USE CONTINUOUS MONITORS; IS THAT CORRECT?

A. YOU USE CONTINUOUS SAMPLERS.

Q. BUT THEY JUST TAKE ONE FIXED POINT IN TIME?

A. NO. THEY -- IN GENERAL THEY'LL TAKE A SAMPLE OVER A SPECIFIED PERIOD OF TIME, AND THEY'RE CUMULATIVE SAMPLES IN THE SENSE THAT THEY COLLECT THE MATERIAL FROM THE AIR, WHICH IS THE MATRIX, OVER WHATEVER PERIOD OF TIME YOU OPERATE THEM. SO THEY'RE CONTINUOUS SAMPLES, BUT THEY'RE NOT CONTINUOUS ANALYSIS.

Q. OKAY. NOW LET'S TALK ABOUT YOUR EMPLOYMENT WITH MONSANTO. IT'S MY UNDERSTANDING THAT YOU STARTED YOUR EMPLOYMENT WITH MONSANTO IN 1967. IS THAT CORRECT?

A. THAT'S CORRECT.

Q. AND THEN YOU WERE EMPLOYED BY MONSANTO THROUGH 1978; IS THAT CORRECT?

A. THAT'S CORRECT.

Q. FIRST OF ALL LET'S TALK A LITTLE ABOUT -- WHERE DID YOU GO OR WHO WERE YOU EMPLOYED BY WHEN YOU LEFT MONSANTO IN 1978?

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION.

WITNESS ANSWERS:

A. AS THE RESUME POINTS OUT, I WENT TO A COMPANY CALLED AMF, INCORPORATED IN STAMFORD, CONNECTICUT.

Q. OKAY. IT JUST -- IT SAYS 1978, AND THEN IT SAYS 1979 IS WHEN YOU BEGAN YOUR ---

A. THAT'S WHEN I -- THESE ARE WHEN I BEGAN WORKING. YOU'LL ALSO NOTICE THAT I JOINED MONSANTO IN '67 BUT I DIDN'T GET A PH.D. UNTIL '68. THAT'S THE DIFFERENCE.

Q. WHAT WAS YOUR FIRST JOB WHEN YOU FIRST WENT TO MONSANTO IN 1967?

A. THE FIRST JOB I HAD WAS AS AN ANALYTICAL CHEMIST --

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A SENIOR RESEARCH CHEMIST IN A GROUP. AND THERE WAS SOME NEW TECHNOLOGY CALLED ATOMIC ABSORPTION SPECTROSCOPY THAT'S USED TO MEASURE LOW LEVELS OF METALS IN VARIOUS KINDS OF MATRICES, AND THEY WANTED TO PURCHASE AN INSTRUMENT FROM PERKIN-ELMER (PHONETIC) AND GET IT UP AND RUNNING AND ESTABLISH IT AS AN ANALYTICAL TECHNIQUE IN THEIR LABORATORIES TO MONITOR METALS AND VARIOUS KINDS OF SAMPLES. SO I LOOKED INTO THAT, FOUND OUT WHICH THE BEST ONE TO USE WOULD BE, ARRANGED FOR THE PURCHASE OF IT, ARRANGED FOR THE DELIVERY OF IT, ARRANGED FOR THE SET-UP OF IT, EVALUATED IT, WROTE THE OPERATING MANUALS, AND BROUGHT THE INSTRUMENT OUT AND VERIFIED THAT IT DID WHAT IT WAS SUPPOSED TO DO AND WROTE THE METHODOLOGY THAT THE INSTRUMENT WAS USED FOR.

Q. AND WHAT WAS THE METHOD IT USED TO ANALYZE METALS?

A. IT WAS FLAME SPECTROSCOPY. THE METAL WAS GENERALLY TAKEN OUT OF WHATEVER MATRIX IT WAS IN AND SOLUBILIZED INTO AN AQUEOUS MATRIX. THE AQUEOUS MATRIX WAS THEN SPRAYED INTO A CHAMBER. THE VAPOR -- - THE MOISTURE VAPOR WITH THE METAL IONS IN IT WOULD'VE BEEN TAKEN INTO A FLAME WHERE THE METAL WAS REDUCED. THE ATOMIC VAPOR THEN WENT UP INTO A PATHWAY WHERE A LAMP THAT HAD A CATHODE THAT WAS MADE OUT OF THAT METAL WHICH WAS BEING HEATED SHINED

LIGHT THROUGH THAT. WHEN THE ATOMS THAT WERE THE SAME AS WHAT WERE IN THE CATHODE WENT THROUGH THAT LIGHT, THEY ABSORBED ENERGY, AND FROM THAT YOU COULD DEDUCT HOW MUCH METAL WAS ACTUALLY IN THE ORIGINAL SAMPLE THAT WAS FED TO THE INSTRUMENT.

Q. AND HOW LONG DID YOU WORK THE ATOMIC ABSORPTION?

A. LET'S SEE. I JOINED MONSANTO IN '67. PROBABLY UNTIL EARLY '68.

Q. AND DID YOU BASICALLY DEAL EXCLUSIVELY WITH METALS DURING THAT TIME PERIOD?

A. THAT'S CORRECT. ON THE OTHER HAND, I WAS HIRED AS A GENERAL ANALYTICAL CHEMIST AND I HAD EXPERTISE, AND I WAS AN ANALYTICAL ORGANIC CHEMIST, SO I HAD OTHER ASSIGNMENTS. IT WASN'T LIKE, YOU KNOW, YOU JUST DID ONE THING ALL THE TIME. THE ONLY TIME YOU DID ONE THING WAS WHEN IT BECAME IMPORTANT ENOUGH THAT YOU COULD BE DEDICATED TO IT.

Q. DURING THAT TIME PERIOD DID YOU EVER ANALYZE SAMPLES FOR PCB'S OR PCB CONTENT?

A. I'M NOT SURE EXACTLY WHEN -- WELL, I WOULD SAY PROBABLY NOT DURING THAT TIME PERIOD, NO, BECAUSE WE DIDN'T REALLY ESTABLISH THE TECHNOLOGY TILL A LITTLE BIT LATER THAN THAT.

Q. WHAT WAS YOUR NEXT POSITION AT MONSANTO?

A. THEY WEREN'T REALLY POSITIONS; THEY WERE MORE

ASSIGNMENTS. MY TITLE STAYED THE SAME. I BELIEVE -- - AT SOME POINT IN TIME I BECAME SUPERVISOR OR GROUP LEADER OF THE WET CHEMISTRY GROUP, WHICH INVOLVED USING WET CHEMICAL TECHNIQUES TO ANALYZE DIFFERENT KINDS OF CONSTITUENTS IN DIFFERENT MATRICES, AND THEN AT SOME POINT I WAS ASSIGNED TO DEVELOP THE PCB METHODOLOGY.

Q. NOW, WHAT TYPE OF MEDIA WERE YOU EVALUATING WITH THE WET CHEMISTRY GROUP?

A. IT COULD BE PRODUCT QUALITY CONTROL. IT COULD BE ANYTHING. WET CHEMISTRY ARE TECHNIQUES THAT ARE USED TO MEASURE THINGS LIKE IONS, CYANIDE, pH, THOSE KINDS OF THINGS. IT'S LIKE METAL SPECTROSCOPY VERSUS ORGANIC SPECTROSCOPY VERSUS WET CHEMISTRY. IT'S JUST A JARGON THAT'S USED FOR DIFFERENT KINDS OF CONSTITUENTS.

Q. DID ANY OF THAT HAVE TO DO WITH DEALING WITH PCB'S?

A. NO.

Q. WHEN DID YOU FIRST GET YOUR ASSIGNMENT TO DEVELOP A TECHNIQUE TO ANALYZE PCB'S?

A. I BELIEVE IT WAS IN '68.

Q. AND WHAT WAS YOUR FIRST ASSIGNMENT?

A. THERE HAD BEEN A TELEX THAT HAD BEEN SENT TO -- I DON'T KNOW WHO GOT IT FIRST, BUT IT EVENTUALLY ENDED UP WITH MY BOSS, WHO HAPPENED TO DR. KELLER. IT WAS

A TELEX FROM ROBIN IN THE UNITED KINGDOM, A PLANT WHERE I BELIEVE WE MANUFACTURED PCB'S IN BRITAIN. AND THEY REPORTED TO WHOEVER THEY WERE REPORTING TO THAT TWO SCIENTISTS IN SWEDEN, A DR. GUNTHER WIDMARK AND A DR. SOREN JENSEN -- WIDMARK WAS KIND OF LIKE THE HEAD OF THE INSTITUTE, AND SOREN JENSEN WAS KIND OF LIKE ME, WORKED AT THE BENCH LEVEL -- HAD FOUND A SUBSTANCE CALLED POLYCHLORINATED BIPHENOLS IN SOME ENVIRONMENTAL SAMPLES, OR THEY FELT THEY HAD FOUND THE MATERIALS IN SOME ENVIRONMENTAL SAMPLES. THE PEOPLE FROM THE U.K. WERE KIND OF SAYING "CAN THIS REALLY BE TRUE? I MEAN, THIS IS KIND OF DIFFERENT," AND THEY HAD SENT IT TO US TO ASK US THAT QUESTION. IT WAS A TELEX. COMMUNICATIONS IN THE LATE 1960'S WERE NOWHERE LIKE THEY ARE TODAY. AND THE TELEX ACTUALLY HAD A TYPO IN IT. THEY CALLED THEM POLYCHLORINATED BIPHENOLS, WHICH IS NOT THE SAME AS POLYCHLORINATED BIPHENYLS, AND IN FACT IT ACTUALLY REPRESENTS A DIFFERENT CLASS OF -- MOLECULAR CLASS OF COMPOUNDS, OF WHICH THEY MANUFACTURED. IT BECAME RESOLVED WHEN WE LOOKED INTO IT THAT IT REALLY WASN'T POLYCHLORINATED BIPHENOLS BUT THAT IT WAS POLYCHLORINATED BIPHENYLS. SO AT THAT POINT IN TIME I WAS ASKED WHAT I THOUGHT ABOUT IT AS A CHEMIST, AND I WAS FURTHER ASKED TO BEGIN TO LOOK AT THE

TECHNIQUES THAT WERE BEING USED BY THESE SCIENTISTS IN SWEDEN TO DO WHAT THEY SAID THEY HAD DID AND TO DO -- TO VERIFY THAT WHAT THEY THOUGHT MIGHT BE TRUE MIGHT BE TRUE. AND THAT'S HOW I FIRST RECEIVED THE ASSIGNMENT TO BEGIN DEVELOPING PCB METHODOLOGY.

Q. WHAT METHODOLOGY DID THEY USE IN SWEDEN?

A. THEY WERE USING A TECHNIQUE CALLED ELECTRON CAPTURE GAS CHROMATOGRAPHY TO MONITOR ENVIRONMENTAL SAMPLES AND OTHER KINDS OF SAMPLES FOR CHLORINATED HYDROCARBONS LIKE DDT AND SOME OF THE OTHER CHLORINATED PESTICIDES THAT WERE INTENTIONALLY SPRAYED AROUND TO CONTROL PESTS. AND FOR A LONG TIME PEOPLE THAT WERE DOING THOSE KINDS OF THINGS HAD SEEN A LOT OF DIFFERENT PEAKS COMING OUT OF THEIR GAS CHROMATOGRAPH THAT WERE DETECTED BY THE ELECTRON CAPTURE DETECTOR. THESE PEAKS -- IT WASN'T NECESSARILY KNOWN WHAT THEY WERE. THE ELECTRON CAPTURE DETECTOR SYSTEM IS NOT AN ABSOLUTE IDENTIFIER. IT JUST GIVES YOU A PEAK AND A CERTAIN RETENTION TIME, DEPENDING UPON THE KIND OF CHROMATOGRAPHIC COLUMN THAT YOU USE, AND YOU HAVE TO COMPARE THAT TO A STANDARD. SO WHEN YOU'RE DEALING WITH A SINGLE CONSTITUENT LIKE DDT, IT'S A FAIRLY SIMPLE PROCESS AND YOU CAN SAY WITH SOME DEGREE OF ASSURITY (PHONETIC) THAT YOU'RE DEALING WITH THE

PESTICIDE DDT. WHEN THEY DID THIS TYPE OF ANALYSIS, THEY SAW OTHER KINDS OF PEAKS PRESENT, AND THEY WEREN'T SURE WHAT THEY WERE. SOREN JENSEN AND GUNTHER WIDMARK, IN COMBINATION WITH A COMPANY CALLED LKB, COMBINED GAS CHROMATOGRAPHY WITH THE MASS SPECTROMETER, AND THAT WAS REALLY THE FIRST TIME THAT HAD BEEN DONE. THE MASS SPECTROMETER IS A MUCH MORE SOPHISTICATED TECHNIQUE THAN ELECTRON CAPTURE DETECTOR, AND IT ALLOWS THE ABSOLUTE IDENTIFICATION, UNDER CERTAIN KINDS OF CIRCUMSTANCES, OF A MOLECULAR STRUCTURE AND THAT KIND OF THING. AND WHEN THEY LOOKED AT SOME OF THESE PEAKS, THEY SAW INDICATIONS FROM FRAGMENTATION PATTERNS THAT THESE WERE POLYCHLORINATED BIPHENYLS. AND SO THAT'S WHAT THEY WERE DOING, AND THAT'S KIND OF THE INSTRUMENTAL TECHNIQUES THAT THEY WERE USING. AND THAT'S WHAT I WAS ASKED TO LOOK AT AND DETERMINE, ONE, BASED ON MY ANALYTICAL CHEMISTRY KNOWLEDGE IF THAT COULD BE TRUE, AND, TWO, IF THAT WAS TRUE, WHAT WOULD IT TAKE FOR US TO BE ABLE TO DO THAT KIND OF THING.

Q. AND THAT'S WHAT'S CALLED GC/MASS SPEC; IS THAT CORRECT.

A. THAT'S CORRECT. GAS CHROMATOGRAPHIC/MASS SPECTROMETRY. MASS SPECTROMETRY IS THE DETECTOR

PORTION OF THE INSTRUMENT, ALTHOUGH IT DOES HAVE SOME SEPARATION CAPABILITY.

Q. HOW LONG HAS THE GAS CHROMATOGRAPH BEEN AROUND?

A. OH, THE GAS CHROMATOGRAPH HAS BEEN AROUND, I WOULD GUESS, PROBABLY 50 YEARS OR BETTER.

Q. AND HOW LONG HAS THE MASS SPEC BEEN AROUND?

A. NOT THAT LONG. THE MASS SPEC -- FOR THE TYPE OF USE THAT WE'RE TALKING ABOUT HERE FOR THE ANALYSIS OF PCB'S, OR FOR THE ANALYSIS OF METAL IONS, OR -- I MEAN, IT JUST DEPENDS.

Q. CAPABLE OF ANALYZING FOR PCB'S.

A. THE TECHNIQUE OF MASS SPECTROMETRY HAS BEEN AROUND AS LONG AS ANYBODY HAS BEEN AROUND. IT JUST HADN'T BEEN DISCOVERED BY ANYBODY UNTIL ABOUT, I WOULD GUESS, MAYBE 40 -- 30, 40 YEARS AGO, SOMETHING LIKE THAT. 30 YEARS AGO, ON THAT -- 30, 40 YEARS AGO, ON THAT ORDER.

Q. HOW DID YOU GO ABOUT TRYING TO VERIFY THE SWEDEN RESULTS?

A. WE ASKED THE EUROPEAN FOLKS TO OBTAIN MORE INFORMATION IN TERMS OF THE DETAILS OF ACTUALLY HOW THEY WORKED UP THE SAMPLES, WHAT SAMPLES THEY ANALYZED, HOW THEY CLEANED UP THE EXTRACTS, HOW THEY DELIVERED THE EXTRACTS TO THE INSTRUMENTATION, WHAT KIND OF INSTRUMENTATION THEY USED, WHAT KIND OF

COLUMNS THEY USED, HOW DID THEY INTERFACE THE INSTRUMENT, WHAT KIND OF ELECTRON CAPTURE DETECTORS DID THEY USE. WE ASKED THEM TO PROVIDE US ALL THE INFORMATION THAT THE SWEDISH FOLKS WERE WILLING TO PROVIDE US WITH AND THAT -- BECAUSE THINGS WERE -- THERE WERE FEW, IF ANY, PUBLICATIONS ON IT, AND THINGS WERE ALL IN PROGRESS. AND THEY WERE ABLE TO GET INFORMATION FROM THE FOLKS, AND THEY PROVIDED US WITH THAT INFORMATION, AND WE USED THAT TO EVALUATE WHAT WAS GOING ON AND DEVELOP THE BASIS FOR WHAT WE EVENTUALLY DID.

Q. SO BASICALLY YOU JUST -- YOUR FIRST STEP, YOU JUST COPIED WHAT THEY HAD DONE IN SWEDEN; IS THAT CORRECT?

A. YEAH, THAT'S CORRECT IN TERMS OF THE GENERAL TECHNIQUES.

Q. WHAT DID YOU DO NEXT?

A. WELL, THAT JUST DIDN'T HAPPEN LIKE THAT. FIRST OF ALL, WE HAD TO VERIFY THAT WE FELT, BASED ON THE TYPES OF SYSTEMS THAT THEY WERE USING, THAT THEY REALLY WERE DOING AND WERE CAPABLE OF DOING WHAT THOSE RESEARCHERS WERE SURMISING FROM THE RESULTS THEY GOT. AND WE DISCOVERED THAT THE POSSIBILITY EXISTED THAT THESE THINGS WERE REALLY DOING THAT, AND THAT WHAT THEY WERE SEEING WERE WHAT THEY WERE

SEEING, BUT WE HADN'T VERIFIED THAT. SO WHAT WE DID AT THAT POINT IN TIME WAS WE LOOKED AROUND IN THE UNITED STATES TO FIND A MANUFACTURER OF SIMILAR EQUIPMENT, AND WE BEGAN LOOKING AT THOSE MANUFACTURERS. AND ULTIMATELY WE ORDERED THE EQUIPMENT AND WAITED FOR IT TO BE DELIVERED, SET IT UP IN THE LABORATORY WITH THEIR HELP AND THEN BECAME FAMILIAR WITH IT. AND THEN -- ONCE WE WERE FAMILIAR WITH THE EQUIPMENT THEN WE BEGAN TO TRY TO ESTABLISH THE SAME KINDS OF SAMPLE WORK-UP AND PREPARATION METHODOLOGY THAT WAS REQUIRED, THAT THEY USED, TO WORK THE SAMPLES UP TO GET THEM TO THE POINT WHERE YOU COULD ACTUALLY DELIVER THEM TO THE INSTRUMENT AND SEE WHAT YOU GOT. THE FIRST INSTRUMENTS THAT WERE USED WERE NOT GC/MASS SPEC INSTRUMENTS BECAUSE THEY WERE NOT COMMERCIALLY AVAILABLE. AS I SAID EARLIER, THE SWEDES WERE THE FIRST PEOPLE TO CONNECT THE TWO INSTRUMENTS TOGETHER. THE MASS SPECTROMETER OPERATES IN A VACUUM, AND THE GAS CHROMATOGRAPH OPERATES UNDER PRESSURE, AND SO INTERFACING THE TWO IS NOT JUST LIKE JUMPING IN YOUR CAR AND TURNING THE IGNITION ON. THE TECHNOLOGY FOR DOING THAT WAS DIFFICULT, NOT WELL KNOWN, AND HAD TO BE HAND BUILT AND FOOLED WITH A LOT. BUT THEY WERE THE ONES THAT DID THAT. SO THE FIRST THING WE SET UP WAS THE MORE

GENERAL TECHNIQUE THAT WAS BEING USED BY THE PESTICIDE ANALYSIS, AND THAT WAS THE GC ELECTRON CAPTURE. AS I SAID, IT'S CAPABLE OF DETECTING ANYTHING THAT WILL CAPTURE ELECTRONS, AND PCB'S HAPPEN TO BE ONE OF THOSE KINDS OF MOLECULES. SO WE SET THAT UP FIRST.

Q. HOW LONG DID IT TAKE YOU TO VERIFY THE RESULTS BY THE GC ELECTRON CAPTURE?

A. MY GUESS IS THAT IT WAS A GOOD SIX MONTHS TO A YEAR BEFORE WE FELT COMFORTABLE WITH WORKING WITH SAMPLES THAT WE WERE SPIKING WITH PCB'S WHERE WE KNEW WE PUT THE MATERIALS THERE AND WE COULD GET THEM BACK UNALTERED AND A HUNDRED PERCENT RECOVERY AND THINGS OF THAT SORT.

Q. SO YOU WOULD TAKE A SAMPLE OF SOIL AND MIX IT WITH PCB'S -- A KNOWN QUANTITY OF PCB'S AND THEN ANALYZE IT? IS THAT WHAT YOU WOULD DO?

A. WE FIRST STARTED WORKING OUT WITH MUCH SIMPLER MATERIALS. WE FIRST WORKED WITH STANDARDS. SINCE WE MANUFACTURED THE PCB'S, YOU KNOW, THE PRODUCTS THAT WE MANUFACTURED WERE THE ONLY STANDARDS THAT WERE REALLY AVAILABLE. POLYCHLORINATED BIPHENYLS ARE A MIXTURE OF 210 DIFFERENT ISOMERS, AND SO THEY'RE -- THEY JUST -- THEY JUST START OUT BEING REAL COMPLEX, AND EACH PRODUCT HAS A DIFFERENT MIX

OF THOSE ISOMERS DEPENDING UPON THE DEGREE OF CHLORINATION AND WHAT THE PRODUCT WAS INTENDED FOR. SO FIRST WE STARTED OUT BY ACTUALLY GETTING SAMPLES OF THE COMMERCIAL AROCLORS FROM OUR OPERATING UNITS, AND THEN WE TOOK THOSE SAMPLES AND THEN DISSOLVED THEM UP IN THE ORGANIC SOLVENT THAT'S USED AS THE VEHICLE TO DELIVER THOSE THINGS TO THE GAS CHROMATOGRAPH AT VERY LOW LEVELS. AND WE JUST RAN THEM THROUGH THE GAS CHROMATOGRAPH NEAT, LIKE YOU WOULD STANDARDS, TO SEE WHAT WE GOT AND TO SEE THE KIND OF PATTERNS AND THE RESPONSES THAT WE GOT AND THEN TO COMPARE THOSE TO WHAT THE ANALYTICAL CHEMISTS IN SWEDEN HAD DONE AND HAD SEEN. AND THEN WHEN WE WERE FAIRLY COMFORTABLE WITH WHAT WE WERE DOING THERE AND WE FELT WE WERE SEEING THE SAME THING THAT THEY WERE SEEING WITH THEIR STANDARDS, THEN -- AND I BELIEVE THE WAY THE SWEDES HAD THE STANDARDS TO BEGIN WITH WAS THEY ACTUALLY GOT THEM FROM OUR U.K. FOLKS. BUT, AT ANY RATE, THEN AT THAT POINT IN TIME WE WENT AND DID WHAT YOU WERE TALKING ABOUT, AND WE DIDN'T START WITH ANYTHING AS COMPLEX AS SOIL. WE STARTED WITH WATER, AND WE JUST SPIKED A LITTLE IN WATER AND THEN RAN THE SAMPLES, AND THEN WE STARTED WITH SOIL AND THAT KIND OF THING.

Q. LET'S BACK UP A LITTLE BIT. WHEN YOU SAY

"STANDARDS," WHAT DID YOU USE FOR STANDARDS?

A. WE USED SAMPLES OF THE COMMERCIAL PRODUCT.

Q. "SAMPLES OF COMMERCIAL PRODUCT" MEANING 1254, 1260?

A. THERE WERE A VARIETY OF PRODUCTS THAT WERE MANUFACTURED, AND THEY WERE DESIGNATED -- ALL OF THE BIPHENYL PRODUCTS WERE DESIGNATED AS 1200. THERE WAS 1221. THERE WAS 1232. THERE WAS 1242, 1248, 1254, 1260, AND THERE WERE EVEN DESIGNATIONS LIKE 1260 AND 1268. THE LAST TWO DIGITS IN THAT -- THE FIRST TWO, 1-2, REFERS TO THE FACT THAT IT'S A BIPHENYL SERIES. THE LAST TWO DIGITS REFER -- WITH THE EXCEPTION OF ONE COMPOUND -- TO THE DEGREE OF CHLORINATION. SO A 42 -- 1242 WAS A BIPHENYL THAT HAD BEEN CHLORINATED TO A 42 PERCENT -- TO CONTAIN 42 PERCENT CHLORINE. A 54, OBVIOUSLY, WAS A 54 PERCENT, AND THAT KIND OF THING.

Q. SO HOW DID 1016 GET ITS NAME?

A. 1016 -- MONSANTO HAD A HABIT OF WHEN THERE WERE NEW COMPOUNDS OR NEW PRODUCTS OR NEW VARIATIONS OF SOMETHING BEING DEVELOPED, OF APPLYING WHAT'S CALLED AN MCS NUMBER. I THINK IT WAS MONSANTO CORPORATE SAMPLE OR SOMETHING LIKE THAT. I CAN'T REMEMBER EXACTLY. IT'S BEEN A LONG TIME. AND IT JUST HAPPENED TO GET THE NUMBER MCS 1016, AND 1016 WAS JUST A NUMERICAL DESIGNATOR FOR THE ORDER IN WHICH

WATER_PCB-SD0000023918

IT OCCURRED. AND THESE COMPOUNDS WERE ALL RECORDED AND HAD THAT AS IDENTITY UNTIL THEY ACTUALLY BECAME SOMETHING. A LOT OF THINGS DIDN'T BECOME SOMETHING. I DON'T EVEN KNOW WHAT MCS 1015 (SIC) WAS, TO TELL YOU THE TRUTH, AND IT COULD'VE BEEN ALMOST ANYTHING. AND THAT GOES FOR MCS 1017. BUT THE SAMPLE DESIGNATION THAT WAS GIVEN TO AROCLOR 1016 WAS MCS 1016, AND, FOR WHATEVER REASONS, IT WAS CARRIED OVER INTO THE PRODUCT NAME WHICH YOU JUST MENTIONED, AROCLOR 1016. AND THAT IS AN EXCEPTION IN THE SENSE THAT IT IS REALLY AROCLOR 1242 THAT'S BEEN FURTHER DISTILLED TO REMOVE AS MUCH AS POSSIBLE FOR THE PENTACHLOROL AND HIGHER HOMOLOGS.

Q. WHAT DID YOU DO AFTER YOU WERE COMFORTABLE RUNNING THE STANDARDS?

A. THEN WE BEGAN TO INTENTIONALLY TAKE MATERIALS THAT WERE CONSIDERED ENVIRONMENTAL TYPE SAMPLES -- SOIL, WATER -- AND WE'D SPIKE THEM WITH -- WE'D RUN THEM WITHOUT SPIKING THEM AND THEN RUN THEM WITH SPIKING THEM TO MAKE SURE THAT WE COULD GET RECOVERY AND THAT THERE WEREN'T MATRIX INTERFERENCES AND THINGS OF THAT SORT IN THESE CLEAN SAMPLES.

Q. AND, AGAIN, YOU'D DO THE EXTRACTION METHOD AND THEN ANALYZE IT THROUGH THE GC?

A. CORRECT.

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Q. ELECTRON CAPTURE FIRST?
A. YES.
Q. THEN WHAT WAS THE NEXT STEP?
A. AT THAT POINT IN TIME WHEN WE FELT COMFORTABLE -- AND BY THAT I MEAN -- IT'S NOT A MATTER OF COMFORT. IT'S A MATTER OF CONFIDENCE. WHEN WE FELT CONFIDENT THAT THE TECHNIQUES WERE WORKING WELL AND THAT THEY WERE DOING WHAT THEY WERE SUPPOSED TO DO AND WE UNDERSTOOD WHAT IT WAS SO THAT WHEN WE TOOK A REAL SAMPLE THAT WE DIDN'T INTENTIONALLY PUT THE MATERIAL IN IT, THEN WE RAN IT. AND IF WE SAW SOMETHING, WE COULD SAY WITH SOME CONFIDENCE THAT IT REALLY WAS IT. THAT'S THE POINT AT WHICH WE HAD GOTTEN THEN BY RUNNING KNOWNS, AND AT THAT POINT IN TIME WE BEGAN TO RUN SAMPLES THAT WERE PROVIDED US FOR -- TO SEE IF PCB'S WERE PRESENT. WE ALSO USED THE TECHNIQUE TO -- LATER ON TO BEGIN TO LEARN A LITTLE BIT MORE ABOUT THE NON-CLASSICAL PHYSICAL PROPERTIES OF PCB'S THAT WE HAD NO REASON TO UNDERSTAND PREVIOUSLY.
Q. AND BY THAT YOU MEAN WHAT HAPPENS WHEN THEY GET IN THE ENVIRONMENT ---
A. WELL, WHAT HAPPENS -- FOR EXAMPLE, PCB'S WERE CONSIDERED INSOLUBLE IN WATER AND -- IT'S LIKE SO MANY THINGS IN LIFE: THERE'S NOTHING THAT'S BLACK AND WHITE. THERE ARE THINGS THAT ARE MOSTLY BLACK,

AND THERE ARE THINGS THAT ARE MOSTLY WHITE. WELL, AT THAT POINT IN TIME PCB'S WERE CONSIDERED NOT SOLUBLE IN WATER, AND THEY WERE NOT SOLUBLE IN WATER. AS A MATTER OF FACT, IT TURNED OUT THAT THE SOLUBILITY OF THE MATERIAL IN WATER -- IT'S REAL SOLUBILITY IS ON THE ORDER OF THE PART-PER-BILLION LEVEL. SO AT THAT POINT IN TIME THEY WEREN'T CONSIDERED SOLUBLE IN WATER, AND NOBODY THOUGHT THAT -- EVEN WORRIED ABOUT WHETHER OR NOT THEY WERE SOLUBLE IN WATER BECAUSE IT WASN'T CONSIDERED A PROPERTY OF PCB'S, OF THE NEAT MOLECULE. AND SO WE BEGAN DEVELOPING USING THAT TECHNIQUE WHERE YOU COULD MONITOR AT VERY LOW LEVELS, WHICH IS AN INHERENT PART OF ELECTRON CAPTURE. ELECTRON CAPTURE BY ITS VERY ESSENCE IS A VERY SENSITIVE TECHNIQUE. WE WERE ABLE TO SHOW THAT "GEE, DOWN AT THE PART-PER-BILLION LEVELS THERE IS WHAT APPEARS TO BE A WATER SOLUBILITY OF AROCLORS." AND OF COURSE THAT DEPENDS ON WHICH AROCLOR YOU'RE TALKING ABOUT, WHICH ISOMER YOU'RE TALKING ABOUT, BUT IN THE CLASSICAL SENSE THEY'RE WATER INSOLUBLE.

Q. LET'S GO BACK AND TALK ABOUT WHEN YOU WERE RUNNING YOUR STANDARDS. WHAT TYPE OF SENSITIVITY COULD YOU GET ON THE ELECTRON CAPTURE?

A. THE SENSITIVITY IS DOWN IN THE RANGE OF ONE TIMES

TEN TO THE MINUS SIXTH TO ONE TIMES TEN TO THE MINUS NINTH GRAMS, AND THAT'S REALLY MICROGRAM, NANOGRAM RANGE, AND THAT'S ON AN ABSOLUTE BASIS IN TERMS OF THE AMOUNT OF MATERIAL THAT'S DELIVERED TO THE DETECTOR. NOW, THAT'S -- I MEAN, THAT -- YOU HAVE TO HAVE A DENOMINATOR, WHICH IS THE SAMPLE, AND IF THE DENOMINATOR IS BIG, THEN THAT NUMBER IS SMALLER -- WELL, IT'S MORE POSITIVE. IF IT'S LARGER, THEN IT'S LOWER, SO -- BUT THE ABSOLUTE DETECTION LEVEL OF THE INSTRUMENT WAS IN THE MICROGRAM TO THE NANOGRAM RANGE.

Q. AND WHEN YOU'RE TALKING ABOUT THE DENOMINATOR, A SAMPLE OF WATER YOU COULD PROBABLY GET A LOWER DETECTION LIMIT THAN YOU COULD IN SOIL. IS THAT A FAIR STATEMENT?

A. THAT'S A FAIR STATEMENT. AND THE REASON IS BECAUSE OF THE MATRIX. IN WATER SAMPLES IT'S PRETTY EASY TO HANDLE A THOUSAND MILLILITERS OR A LITER OF THE SAMPLE IN THE LABORATORY. IT'S PRETTY DIFFICULT TO HANDLE A FULL KILOGRAM OF SOIL AND TO EXTRACT IT. SO, YES, THAT'S CORRECT. IF THE DENOMINATOR IS LARGE, THEN YOUR DETECTION LIMIT GOES DOWN. IF YOUR DENOMINATOR IS SMALLER, AS IT WOULD BE WITH SOIL SAMPLES, THEN THE DETECTION LIMIT GOES UP.

Q. SO BACK IN LATE 1968, MAYBE EARLY 1969 YOU WERE ABLE

TO DETECT PCB'S IN THE PART PER MILLIONS OR PART PER BILLION IN SOIL. IS THAT A FAIR STATEMENT?

A. I WOULD SAY A FAIRER STATEMENT IS TO SAY THAT WE BEGAN TO DEVELOP THE CONFIDENCE IN THE ANALYTICAL METHODOLOGY AND TO ESTABLISH THE METHODOLOGY THAT WOULD ALLOW US TO DO THAT KIND OF THING. I DON'T -- IT WAS PROBABLY MUCH LATER THAN THAT THAT WE WERE REALLY READY TO GO OUT AND DO ENVIRONMENTAL SAMPLES AND BE ABLE TO SWEAR THAT WHAT WE WERE SEEING WAS PROBABLY PCB'S OR NOT PCB'S. THERE ARE A LOT OF THINGS THAT CAPTURE ELECTRONS, AND THERE ARE A LOT OF CONSTITUENTS IN ENVIRONMENTAL SAMPLES THAT CAN PROVIDE INTERFERENCES AT THOSE KINDS OF LEVELS THAT CAN CAUSE CONFUSION. SO IT'S A -- IT'S NOT AN EASY PROCESS. IT'S A DIFFICULT PROCESS.

Q. OKAY. AFTER YOU BEGAN TO RUN THE ACTUAL ENVIRONMENTAL SAMPLES WHAT DID YOU DO NEXT?

A. WHEN YOU SAY "ACTUAL ENVIRONMENTAL SAMPLES," DO YOU MEAN ONES THAT WE INTENTIONALLY SPIKED WITH MATERIALS?

Q. YOU HAD TALKED -- I THINK WE TALKED ABOUT THAT. CORRECT?

A. YEAH. I DID, YES.

Q. WHAT DID YOU DO NEXT AFTER THAT?

A. AFTER WE WERE FAIRLY SURE THAT WE COULD DO THIS IN

THE LABORATORY I BELIEVE THAT WE COLLECTED SOME SAMPLES. WE DECIDED WHERE WOULD PCB'S BE IF THEY WERE GOING TO BE SOMEWHERE, AND I BELIEVE SOME SAMPLES WERE COLLECTED OUTSIDE OUR ANNISTON, ALABAMA PLANT.

Q. SO IF I UNDERSTAND WHAT YOU'RE SAYING, YOU SAID THE MOST LIKELY PLACE THAT YOU THINK THEY WOULD BE WOULD BE OUTSIDE THE MONSANTO PLANT?

A. WELL ---

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION. GO AHEAD.

WITNESS RESUMES ANSWER:

A. IF THE PLANT WAS THE SOURCE OF THE MATERIAL, THEN ONE WOULD GUESS THAT THE HIGHEST CONCENTRATION OF THE MATERIAL WOULD BE OUTSIDE THE PLANT IF IT WAS THERE AT ALL. AND INITIALLY WE WERE WONDERING WHERE THE MATERIALS WERE BECAUSE WE DIDN'T HAVE AN IDEA -- NOT AN IDEA OF HOW THINGS MOVED AROUND IN THE ENVIRONMENT OR ANY CLUE AS TO WHY A PRODUCT THAT WAS MANUFACTURED TO BE SOLD AND NOT INTENTIONALLY SPREAD AROUND WAS BEING FOUND ANYPLACE, AND IN FACT THERE WERE A LOT OF OTHER THEORIES AS TO WHERE THOSE MOLECULES REALLY MIGHT BE COMING FROM. SO THE ISSUE WAS "GEE, WHERE CAN WE FIND -- WHERE DO WE THINK WE CAN FIND PCB'S," SO WE WENT TO WHERE WE THOUGHT IT

WAS THE HIGHEST PROBABILITY, AND THE HIGHEST PROBABILITY OF COURSE WAS RIGHT WHERE IT WAS MANUFACTURED.

Q. DID YOU ACTUALLY TAKE THE SAMPLE IN ANNISTON?

A. DID I PHYSICALLY TAKE THE SAMPLES?

Q. YES.

A. NO.

Q. WERE YOU PRESENT WHEN THEY TOOK THE SAMPLES?

A. NO, I WAS NOT.

Q. DO YOU KNOW WHO TOOK THE SAMPLES?

A. NO, I DON'T.

Q. WERE YOU PERSONALLY INVOLVED IN ANALYZING THE SAMPLES?

A. YES, I WAS.

Q. WHERE WERE THE SAMPLES TAKEN FROM IS YOUR UNDERSTANDING?

A. THE SAMPLES WERE TAKEN BY PLANT PERSONNEL, AND I'M SURE THERE'S RECORDS THAT WOULD IDENTIFY THE INDIVIDUALS IN QUESTION WHO DID IT AND HOW THEY DID IT. AS I RECALL, THE FIRST SAMPLES WERE TAKEN -- THERE WAS A DRAINAGE DITCH ASSOCIATED WITH THE PLANT, AND, IF I REMEMBER CORRECTLY -- THIS WAS BACK IN, I THINK, '69 OR SO -- THE SAMPLES WERE TAKEN FROM THE DRAINAGE DITCH.

Q. AND WHAT WERE YOU ABLE TO DETERMINE WAS IN THOSE

SAMPLES?

A. AT SOME POINT IN TIME WE DETERMINED THAT PCB'S WERE IN SAMPLES TAKEN FROM THAT AREA.

Q. AND HOW LONG WAS IT AFTER YOU TOOK THE SAMPLE THAT YOU WERE ABLE TO DETERMINE THAT?

A. MY RECOLLECTION IS, IS THAT IT TOOK LONGER THAN A LOT OF PEOPLE WANTED IT TO BECAUSE THERE WAS SO MUCH TECHNICAL DIFFICULTY IN ESTABLISHING THE TECHNIQUES. I BELIEVE WE RECEIVED THE SAMPLES A LONG TIME BEFORE WE ACTUALLY GOT THEM ANALYZED. I DON'T KNOW SPECIFICALLY.

Q. A LONG TIME TO MY TWO-YEAR-OLD IS ABOUT FIVE MINUTES. A LONG TIME TO SOMEONE MY AGE OR YOUR AGE MIGHT BE MONTHS. I MEAN, ARE WE TALKING MONTHS?

A. IT WOULD'VE BEEN A VERY LONG TIME TO A TWO-YEAR-OLD. PROBABLY MONTHS.

Q. OKAY. LESS THAN A YEAR?

A. YES.

Q. OKAY.

A. IT WAS EASIER TO TAKE SAMPLES THAN IT WAS TO ANALYZE THEM, BELIEVE ME.

Q. HOW DID YOU -- WHAT PCB'S DID YOU DETERMINE WERE IN THAT SAMPLE?

A. MY RECOLLECTION IS THAT AT THAT TIME WE WERE USING AROCLOR 1242 AND AROCLOR 1260 TO BRACKET THE AREA IN

WHICH THE PCB'S THAT WERE BEING FOUND IN THE ENVIRONMENT, FOR EXAMPLE, IN SWEDEN. THOSE TWO COMPOUNDS HAVE ALL THE ISOMERS THAT ARE IN THAT RANGE. AROCLOR 1242 HAS SOME MONOCHLOR, SOME DYE, SOME -- I MEAN, EACH AROCLOR CONTAINS A LITTLE OF ALL OF THE ISOMERS. SO WE HAD USED AROCLOR 1242 AND AROCLOR 1260, WHICH REPRESENTED THE RANGE OF WHAT THE SWEDISH FOLKS WERE SEEING.

Q. SO HOW DID YOU REPORT THE RESULTS OF YOUR SAMPLE?

A. THEY WOULD BE REPORTED AS PARTS PER MILLION, PARTS PER BILLION, OR SOME CONCENTRATION RELATED TO THE PRODUCTS AROCLOR 1242 AND/OR AROCLOR 1260 AS THE STANDARDS.

Q. SO, IN OTHER WORDS, YOU WOULDN'T REPORT ANY 1254?

A. IT REALLY WOULDN'T MAKE ANY DIFFERENCE. THE NUMBER THAT WAS SIGNIFICANT INITIALLY WAS THE TOTAL PCB'S, AND THEN AFTER THAT IT WAS, LIKE, "OKAY, WHAT KIND OF PCB'S?"

Q. HOW DID YOU DETERMINE HOW MUCH 1242 WAS IN THE SAMPLE? IN OTHER WORDS, DID YOU ANALYZE -- DID YOU TAKE ALL THE PEAKS, OR DID YOU JUST TAKE SPECIFIC PEAKS?

A. AT THAT POINT IN TIME THE BEST WAY TO QUANTITATE PCB'S IN ENVIRONMENTAL SAMPLES WAS BEING DEVELOPED, AND IT WAS REALLY UP TO -- IT WAS VERY QUESTIONABLE

AS TO WHAT MIGHT BE THE BEST WAY, AND IT REALLY DEPENDED UPON THE SAMPLE YOU WERE DEALING WITH. THE SAMPLES THAT THE SWEDES WERE DEALING WITH, WHEN YOU LOOKED AT THE PEAKS THAT THEY SAW AND THINGS OF THAT SORT, IT LOOKED NOTHING LIKE ANY OF OUR PRODUCTS. THEY HAD CONSTITUENTS THAT HAD THE SAME KINDS OF RETENTION TIMES AND, OF COURSE, SHOWED ELECTRON CAPTURE RESPONSE, AND THEY WERE IDENTIFIED BY MASS SPEC AS BEING POLYCHLORINATED BIPHENYLS. BUT THE ACTUAL FINGERPRINT THAT YOU SAW IN ELECTRON CAPTURE GAS CHROMATOGRAPH REALLY DIDN'T LOOK LIKE THE PRODUCT. SO WHEN WE WOULD DO A RUN, WE MIGHT RUN 1242, 1254, 1260, OR WE MIGHT JUST SAY "OKAY, LET'S JUST RUN 42 AND 60, AND LET'S SEE WHAT WE FIND IN THOSE REGIONS, AND LET'S QUANTITATE IT AS THAT." AND THAT WAY WE KNEW FOR SURE THAT WE WERE AT LEAST -- THAT WE WERE NOT UNDERESTIMATING WHAT WAS PRESENT.

Q. SO DID YOU JUST -- DID YOU -- WOULD YOU USE ALL THE PEAKS AND CALCULATE FROM ALL THE PEAKS?

A. IN SOME INSTANCES, YES. IF THE FINGERPRINT EXACTLY MATCHED A PRODUCT -- AN AROCLOR THAT WAS BEING USED AS A STANDARD, THEN YOU COULD USE ALL OF THE PEAKS IF YOU WANTED TO, TO QUANTITATE IT, OR YOU COULD USE THE THREE DOMINANT ONES OR LIKE THE EPA METHODOLOGY

TODAY REQUIRES YOU USE FIVE -- THREE TO FIVE PEAKS. SO INITIALLY WE WOULD USE THE TOTAL AREA AND SAY, "GEE, THE MAXIMUM AMOUNT OF PCB'S THAT COULD BE THERE WOULD BE THIS AMOUNT." THEN IF WE LOOKED AT IT AND THE PATTERN WAS EXACT, WE'D SAY, "WELL, YOU KNOW, THIS IS CERTAINLY PCB'S. BUT THESE GUYS OVER HERE ARE NOT PCB'S, SO IT'S NOT FAIR TO COUNT THOSE IN, SO, REALLY, THE PCB'S THAT ARE THERE ARE THIS." SO IF THE PATTERN WAS EXACTLY WHAT IT WAS SUPPOSED TO BE, WE MIGHT JUST USE THREE TO FIVE PEAKS TO QUANTITATE IT, BUT IT WAS REALLY UP IN THE AIR AT THAT TIME. IF YOU WERE USING MATERIALS THAT YOU SPIKED WITH PCB'S AND YOU KNEW WHAT YOU HAD THERE, THEN YOU KNEW HOW TO QUANTITATE IT AND THAT KIND OF THING, BUT WITH ENVIRONMENTAL SAMPLES IT WAS DIFFERENT, SO YOU HAD TO REVIEW EVERY ONE VERY CAREFULLY, MAKE SURE THAT RETENTION TIMES IN -- THE RETENTION TIMES MATCHED, THE SHAPES MATCHED, THOSE KINDS OF THINGS. AND IN FACT WE SPENT A FAIR AMOUNT OF TIME DEVELOPING CHEMICAL TREATMENTS FOR THE EXTRACTS THAT WOULD DIFFERENTIATE. FOR EXAMPLE, IF YOU TAKE A HEXANE EXTRACT OF A SAMPLE THAT HAS PCB'S IN IT AND YOU SHAKE IT UP WITH CONCENTRATED SULFURIC ACID, NON-PCB AROMATIC COMPOUNDS ARE EXTRACTED INTO THE SULFURIC ACID. NOW, NON-PCB AROMATIC COMPOUNDS

HAVE ELECTRON CAPTURE RESPONSE, SO IF YOU RUN THE SAMPLE BEFORE AND AFTER, YOU CAN TELL, OKAY, IF SOMETHING GOES AWAY, THOSE WEREN'T PCB'S. SO WHAT WE DID WAS WE DOCUMENTED HOW WE DID IT SO THAT IF DOWN THE ROAD WE FOUND A BETTER WAY TO DO IT, WE COULD ALWAYS PRORATE OUR RESULTS SO THAT WE KNEW WE WERE DOING THAT KIND OF THING. ALSO WE REALLY OPERATED ON THE PRINCIPLE TO BE SAFE THAN SORRY. IF ANYTHING, WE MADE SURE THAT WE WERE OVERESTIMATING VERSUS UNDERESTIMATING WHAT WE WERE SEEING.

Q. WHEN YOU FIRST RAN THE SAMPLES FROM THE ANNISTON PLANT AND REPORTED THEM AS 1242 AND 1260, HOW WELL DID THEY MATCH THE ACTUAL PRODUCT?

A. MY RECOLLECTION IS, IS THAT THERE WAS A FAIRLY GOOD MATCH, BUT I'D HAVE TO ACTUALLY LOOK AT THE CHROMATOGRAM AGAIN TO VERIFY THAT. BUT MY RECOLLECTION IS, IS THAT THERE WAS A PRETTY GOOD MATCH.

Q. WHAT DID YOU DO NEXT AFTER YOU HAD ANALYZED THE SAMPLES FROM ANNISTON?

A. CAREFULLY VERIFIED THE RESULTS, REVIEWED EVERYTHING, AND THEN PROBABLY WROTE A MEMO OR A REPORT TO THE PEOPLE THAT SUBMITTED THE SAMPLES.

Q. WHAT DID YOU DO NEXT?

A. PROBABLY SUGGESTED THAT WE MIGHT WANT TO DO SOME

MORE SAMPLING. AS I RECALL, THE RESULTS ON THOSE SAMPLES THAT WERE TAKEN VERY CLOSE TO THE PLANT WERE POSITIVE, AND OUR OBJECTIVE (SIC) AT THAT TIME WAS SURPRISE. WE WERE SURPRISED, AND WE WANTED TO KNOW "GEE, WELL, IF THEY'RE THAT CLOSE TO THE PLANT, OKAY, WE CAN KIND OF UNDERSTAND THAT. WHERE MIGHT THEY BE TOO?" AND SO WE BEGAN TO DETERMINE FURTHER AWAY AND IN OTHER PLACES WHERE THE MATERIALS WERE. WE ALSO BEGAN TO THINK ABOUT DEVELOPING THE METHODOLOGY AND ESTABLISHING METHODOLOGY AT THE PLANT SO THEY COULD RUN THEIR OWN SAMPLE. THEY WEREN'T THE ONLY PEOPLE THAT WE HAD BEGUN TO SUPPORT. WE BEGAN TO ANALYZE OTHER THINGS FOR PCB'S THAT WERE PROVIDED TO US. THAT'S ALL A MATTER OF THE RECORD, AND I DON'T REMEMBER ANY OF IT SPECIFICALLY, BUT WE STARTED GETTING A LOT OF SAMPLES PRETTY QUICK WHEN WE VERIFIED THAT WE COULD RUN PCB'S.

Q. WHAT WERE YOUR DETECTION LIMITS IN THAT ORIGINAL -- IN THOSE ORIGINAL SAMPLES THAT YOU RAN?

A. DOWN IN THE PART-PER-MILLION RANGE, CERTAINLY.

Q. ARE YOU TALKING SINGLE PART-PER-MILLION?

A. YES. PART-PER-MILLION/PART-PER-BILLION RANGE, DEPENDING UPON HOW MUCH DILUTION YOU HAD TO GO THROUGH TO GET RID OF INTERFERENCES, DEPENDING UPON

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HOW BIG A SAMPLE THAT YOU COULD PROCESS.

Q. ARE YOU AWARE OF WHAT FURTHER SAMPLING TOOK PLACE AFTER THE ORIGINAL SAMPLES?

A. SURE. I KNOW THAT THERE WAS SOME FURTHER SAMPLES PROVIDED BY THE ANNISTON FOLKS TO US THAT -- MY UNDERSTANDING IS THAT IT INVOLVED GOING FROM THE DRAINAGE DITCH INTO SNOW CREEK AND -- WHAT WAS IT? -- CHOCCOLOSSA (PHONETIC) CREEK AND THAT DIRECTION.

Q. HOW MUCH WERE YOU INVOLVED IN THE ANALYTICAL PROCESS OF THOSE SAMPLES?

A. IN THE EARLY BEGINNING THE SAMPLES WERE PRETTY MUCH SUBMITTED TO OUR LABORATORY BECAUSE WE HAD THE ONLY CAPABILITY WITHIN THE COMPANY -- AND AROUND, REALLY -- FOR MEASURING PCB'S, AND SO WE DID WHATEVER WE COULD IN TERMS OF WHAT WE WERE PROVIDED. I DO KNOW THAT WE MADE AN EFFORT TO ESTABLISH THE SAME KIND OF TECHNIQUES AT THE PLANT AND, IN FACT, WE DID ESTABLISH AND TRAIN THE FOLKS AT THE PLANT TO RUN THEIR OWN SAMPLES, AND I KNOW THEY WENT FORWARD AND RAN SAMPLES.

Q. DO YOU KNOW WHEN THE PLANT SAMPLER WAS UP AND RUNNING?

A. '69 SOUNDS. . .

Q. WHO WAS IN CHARGE AT THE ANNISTON PLANT OF THIS PROCESS?

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A. I REMEMBER A GENTLEMAN NAMED BUNKY WRIGHT, BUT I DON'T REMEMBER HIS SPECIFIC POSITION. BUT I DO REMEMBER COMMUNICATING WITH HIM, AND I THINK MAYBE HE WAS, LIKE, A TSD GUY OR A LAB SUPERVISOR OR SOMETHING LIKE THAT.

Q. SO IT WOULD'VE BEEN AN ANALYTICAL CHEMIST DOING THAT TYPE OF WORK?

A. OR AN ANALYTICAL TECHNICIAN. THE INITIAL WORK THAT WAS DONE BY THE LABORATORY, THE PEOPLE WERE TRAINED IN MY LAB. WE BROUGHT THEM UP FROM ANNISTON, ALABAMA AND TRAINED THEM ON OUR EQUIPMENT. WE PROVIDED THEM WITH AN UNDERSTANDING OF THE TYPE OF EQUIPMENT THAT WAS USED TO DO THAT, WHICH THEY THEN SUBSEQUENTLY PURCHASED. ONCE THEY ESTABLISHED THE TECHNIQUES IN THEIR LABORATORY I'M SURE WE EXCHANGED SAMPLES AND I REVIEWED THE INFORMATION THAT WAS GENERATED BY THEM, AND I GAVE THEM, YOU KNOW, THE CONFIDENCE THAT THEY WERE DOING THINGS CORRECTLY.

Q. AFTER THE LAB STARTED UP AT THE ANNISTON PLANT IN 1969 DID YOU HAVE ANY FURTHER INVOLVEMENT OF SAMPLES TAKEN FROM AND AROUND THE PLANT?

A. I THINK THERE MAY HAVE BEEN SOME AFTER '69. IT'S TYPICAL TO DO -- WHEN YOU HAVE THE TECHNIQUE, TO DO IT FOR THEM, TRAIN THEM HOW TO DO IT, AND THEN DO IT IN PARALLEL WITH THEM OR -- WITH THEM. AND THEN

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ONCE EVERYBODY IS SATISFIED THEY'RE DOING YOUR THINGS THEY CAN CONTINUE TO DO YOUR THING AND YOU CAN MOVE ON TO OTHER AREAS THAT YOU'RE REQUIRED TO.

Q. WHAT OTHER AREAS DID YOU MOVE ON TO AFTER YOU GOT THE ANNISTON PLANT UP AND RUNNING THEIR SAMPLES?

A. WE BEGAN TO LOOK AT ALL THE DIFFERENT USES OF THE PRODUCT THAT WE KNEW ABOUT AND BEGAN TO TRY AND FIGURE OUT WHAT KINDS OF THINGS WE SHOULD BE SAMPLING AND ANALYZING AND LOOKING AT.

Q. AND WHAT TYPES OF THINGS DID YOU START -- WHAT TYPES OF THINGS DID YOU START SAMPLING AND ANALYZING?

A. WELL, FIRST OF ALL IT WAS A SHOCK TO US THAT PCB'S WERE FOUND IN SWEDEN, AND WE DIDN'T ATTACH -- WE DIDN'T PUT THE TWO TOGETHER. WHEN WE BEGAN TO FIND THAT THERE WERE PCB'S AT THE OUTFALL IN ANNISTON, IN A DRAINAGE DITCH AND THINGS OF THAT SORT, IT DAWNED ON US THAT THERE MIGHT BE PCB'S OTHER PLACES TOO THAT WERE THERE AS A RESULT OF THE USE OF THAT MATERIAL AS A PRODUCT. AT THE ANNISTON PLANT OUR OBJECTIVE THERE WAS TO MANUFACTURE THE MATERIAL, SHIP IT OUT THE DOOR, AND SELL IT TO OUR CLIENT. AND SO THE OBJECTIVE WAS TO PUT A HUNDRED PERCENT OF THE MATERIAL OUT THE DOOR AND SELL IT, BECAUSE THAT'S THE WAY THE ANNISTON PLANT MADE THE MONEY THAT PAID FOR THE EQUIPMENT, THAT PAID THE SALARIES,

AND THAT'S WHAT WE WERE IN BUSINESS FOR. SO THERE WAS NO INTENTION TO DISTRIBUTE THE MATERIAL, NOT LIKE WITH DDT OR A PESTICIDE WHERE THE INTENTION AND ITS END USE IS THE DISTRIBUTION OF THE MATERIAL IN THE ENVIRONMENT. SO WE WERE SURPRISED BY THAT, AND WE BEGAN TO THINK, "WELL, GEE, PCB'S ARE USED FOR A LOT OF THINGS." THEN WE BEGAN TO WONDER WHETHER OR NOT THERE WERE MATERIALS THAT WERE BEING DISTRIBUTED BY THOSE TYPES OF USES, AND SO WE BEGAN TO GET SAMPLES FROM OTHER FOLKS TO DETERMINE WHETHER OR NOT THERE WERE PCB'S THAT WERE COMING FROM OTHER USES OF THE PRODUCTS THAT WE WERE SELLING. AND WE WOULD ANALYZE THEM TO DETERMINE WHETHER OR NOT WE THOUGHT PCB'S WERE PRESENT, AND WE WOULD SHARE WHATEVER THOSE RESULTS WERE WITH WHOEVER HAPPENED TO PROVIDE US THE SAMPLES, WHETHER IT WOULD BE A CLIENT OR GOVERNMENT AGENCY OR A STATE AGENCY, THAT KIND OF THING.

Q. WHAT DID YOU DO NEXT?

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION. IF YOU COULD BE A LITTLE MORE SPECIFIC.

WITNESS ANSWERS:

A. YEAH. I WOULD SAY WHAT WE DID NEXT WAS A LOT MORE OF WHAT WE WERE DOING, BECAUSE AT THAT POINT IN TIME

WE HADN'T -- WE HAD THE CAPABILITY TO RUN A FAIR NUMBER OF SAMPLES BUT NOTHING LIKE THE NUMBER OF SAMPLES THAT WERE EVENTUALLY RAN. WE SPENT A LOT OF TIME RUNNING SAMPLES WITHIN OUR OWN LABORATORY AND TRAINING MORE PEOPLE AND GETTING MORE EQUIPMENT. WE SPENT A LOT OF TIME ANALYZING SAMPLES, INSURING THE RESULTS. WE SPENT A LOT OF TIME TALKING TO OTHER RESEARCHERS WHO BEGAN TO LOOK AT THE RESULTS THAT THEY WERE GENERATING IN TERMS OF PCB'S. WE EVEN WENT TO THE EXTENT OF ISOLATING LARGE QUANTITIES, ON AN ANALYTICAL SCALE, OF THE PRODUCT AND HAVING GOOD CHAIN-OF-CUSTODY RECORDS AND THINGS OF THAT SORT OF EACH OF THE PRODUCTS SO THAT WE COULD PROVIDE STANDARDS TO THE PEOPLE THAT WANTED TO USE THOSE TO DETERMINE WHETHER OR NOT THEY TOO WERE SEEING PCB'S. AND IN FACT THAT GOT TO BE SUCH A HEAVY DUTY THING THAT, YOU KNOW, WE HAD PEOPLE THAT JUST DID THAT. THEY JUST PROVIDED SAMPLES TO FOLKS THAT WERE REQUESTING THEM.

WHAT ELSE DID WE DO. WE ALSO BEGAN TO TRY TO ESTABLISH IN OUR LABORATORY THE MORE DIFFICULT CONNECTION OF HOOKING A MASS SPEC TO A GAS CHROMATOGRAPH, AND THAT WAS DONE FAIRLY SOON. WE HAD TO LOOK INTO WHAT KIND OF MASS SPECS WE WANT, AND WE HAD TO GET THE PEOPLE TO DO IT, AND WE HAD TO

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BUILD THE INTERFACE. WE HAD TO BUILD THE INTERFACE OURSELVES AND HOOK IT UP AND MAKE SURE IT WORKED. TODAY A HIGH SCHOOL STUDENT CAN TAKE A $50,000 PIECE OF EQUIPMENT AND DO WHAT TOOK US A WEEK AND TWO OR THREE PH.D.'S TO DO AND, AT THAT TIME, PROBABLY A COUPLE HUNDRED THOUSAND DOLLARS' WORTH OF EQUIPMENT. SO TECHNOLOGY HAS ADVANCED HUGELY IN 1999 VERSUS 1969.

BUT WE WERE ABLE TO EVENTUALLY ESTABLISH THE INTERFACE BETWEEN THE MASS SPEC AND GC, AND WE WERE ABLE TO VERIFY THAT WE COULD RUN PCB'S THROUGH THE GC AND GET THEM INTO THE MASS SPEC AND IDENTIFY THEM AND ACTUALLY DO THAT IN SAMPLES TOO. SO CONCURRENTLY THAT KIND OF EFFORT WAS GOING ON ALSO.

Q. AND ABOUT WHAT YEAR DID THAT HAPPEN?

A. IT HAD TO BE AFTER 1969. PROBABLY IN LATE '69, '70, IN THAT REGION.

Q. WHAT OTHER TYPE OF ACTIVITIES DID YOU DO AS A SENIOR RESEARCH CHEMIST AND AS A RESEARCH GROUP LEADER?

A. MY PRIME FUNCTION AT THAT TIME REALLY BEGAN TO BE 100 PERCENT PCB'S AND THOSE THINGS ASSOCIATED WITH IT. I SPENT A LOT OF TIME EXPLAINING TO PEOPLE WHAT PCB'S WERE. I SPENT A LOT OF TIME FINDING OUT WHAT PCB'S WERE MYSELF FROM AN ANALYTICAL AND AN ENVIRONMENTAL VIEWPOINT. WE INITIATED A LOT OF

STUDIES, AS I SAID, TO LEARN ABOUT THE SOLUBILITY OF PCB'S. WE ALSO -- THERE WAS VERY LITTLE, IF ANY, DELIBERATELY GENERATED TISSUE RESIDUE DATA, YOU KNOW, THINGS OF THAT SORT, AND THEY ALSO BEGAN -- THE ACUTE TOXICITY OF PCB'S WAS SO LOW THAT THERE WAS LITTLE, IF ANY, CONCERN ABOUT TOXICITY OF PCB'S AT THAT POINT. THEY BEGAN TO WANT TO KNOW WHAT HAPPENED ON A MORE LONGER-TERM BASIS, SO WE INITIATED CHRONIC ANIMAL STUDIES. AND IN CONJUNCTION WITH THE CHRONIC ANIMAL STUDIES, SINCE WE DIDN'T KNOW WHAT WAS HAPPENING TO PCB'S IN THE ENVIRONMENT THROUGH THE, YOU KNOW, METABOLISM, THROUGH BIOTRANSFORMATION, THROUGH PHYSICAL THINGS, WE BEGAN TO -- IN PARALLEL WITH THAT WE DEVELOPED TISSUE COLLECTION TECHNIQUES AND TISSUE RESIDUE ANALYSIS TECHNIQUES SO THAT WE COULD MONITOR THE MATERIAL THAT WAS FED, SO WE COULD MONITOR WHERE IT WENT IN THE ANIMALS IT WAS FED TO, SO WE COULD MONITOR THE AMOUNT THAT MIGHT BE IN THE FECES AND THE URINE. WE LOOKED AT AVIAN, AQUATIC, AND MAMMALIAN SPECIES IN THE LABORATORY THAT WERE DELIBERATELY EXPOSED IN TOXICITY TESTS, AND WE HAD THEM RUN, IN PARALLEL, ANIMALS THAT WERE ALSO DOSED, AND COLLECTED THOSE TISSUES AND ANALYZED THEM. AND WE HAD TO DEVELOP THE TECHNIQUES FOR ANALYZING THOSE

TISSUES.

Q. YOUR INVOLVEMENT IN THOSE STUDIES WAS THE ANALYSIS OF THOSE DIFFERENT MEDIAS; IS THAT CORRECT?

A. THAT'S CORRECT.

Q. WHO ACTUALLY PERFORMED THE ANIMAL STUDIES FOR YOU?

A. THE ANIMAL STUDIES AT THAT POINT IN TIME WERE DONE BY A COMPANY CALLED INDUSTRIAL BIO TEST -- IBT -- AND I THINK THEY WERE IN CHICAGO AREA.

Q. WHAT TYPES OF MATERIALS WERE SUPPLIED TO IBT?

A. KNOWN, WELL-DEFINED SAMPLES OF THE PRODUCTS.

Q. WHAT DO YOU MEAN BY "KNOWN, WELL-DEFINED SAMPLES OF THE PRODUCTS"?

A. WELL, A KNOWN QUANTITY OF THE MATERIAL THAT WAS CERTAINLY MORE THAN ENOUGH FOR ITS TOXICITY STUDY, PLUS ENOUGH TO HAVE SAMPLES FOR FUTURE USE, SHOULD WE DISCOVER WE NEEDED TO CHARACTERIZE IT IN A DIFFERENT FASHION OR SOMETHING OF THAT SORT, WERE OBTAINED. THOSE WERE OBTAINED FROM PRODUCTION THAT OCCURRED AT A SPECIFIC TIME. THAT PRODUCTION WAS NORMAL PRODUCTION, BUT WE KNEW EXACTLY WHERE IT CAME FROM, WHEN IT CAME FROM, WHO HANDLED IT, HOW THEY HANDLED IT, WHERE IT WAS STORED, HOW MUCH WAS USED, AND THAT KIND OF THING. WE DELIBERATELY ESTABLISHED A CHAIN OF CUSTODY SO THE INTEGRITY OF THE MATERIAL THAT WE USED WAS KNOWN.

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Q. AND WHEN YOU SAY "NORMAL PRODUCTION," WHICH PLANT WAS IT TAKEN FROM?

A. I BELIEVE MOST OF THE SAMPLES CAME FROM THE ANNISTON PLANT.

Q. WAS ANYTHING SPECIAL DONE TO THE SAMPLES AFTER THEY WERE TAKEN OFF THE LINE?

A. NO. THE ONLY THING SPECIAL DONE WAS THAT, AS I SAID, THEY WERE ESTABLISHED UNDER A CHAIN-OF-CUSTODY SITUATION WHERE, YOU KNOW, YOU KNEW WHERE THEY WERE STORED AND YOU KNEW NOBODY COULD FOOL AROUND WITH THEM AND YOU KNEW THEIR INTEGRITY WAS PROTECTED. SO THAT IN CASE THERE MIGHT BE SOMETHING UNUSUAL ABOUT IT OR IF YOU NEEDED TO KNOW MORE ABOUT THE MATERIALS OR BETTER TECHNIQUES CAME ALONG FOR CHARACTERIZING THE MATERIALS YOU COULD USE THAT AND HAVE CONFIDENCE THAT IT WAS THE SAME MATERIAL THAT WAS USED IN THE STUDIES.

Q. WERE SPECIAL PRECAUTIONS TAKEN TO ASSURE THAT THE PLANT WAS OPERATING PROPERLY WHEN THE SAMPLES WERE TAKEN?

A. I'M NOT FAMILIAR WITH THAT, AND I DOUBT WHETHER IT WAS OR NOT. I THINK THE PLANT OPERATED FAIRLY WELL MOST OF THE TIME.

Q. WHAT OTHER TYPE OF THINGS DID YOU DO AS A RESEARCH GROUP LEADER FOR MONSANTO?

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A. WELL, I EVALUATED THE PEOPLE THAT WORKED FOR ME, RECOMMENDED PROMOTIONS FOR THEM, RECOMMENDED RAISES, MADE SURE THAT THEY WERE TRAINED PROPERLY. YOU KNOW, THE KINDS OF THINGS THAT ARE ASSOCIATED WITH A GROUP LEADER'S RESPONSIBILITY, BUT THE FOCUS OF MY TECHNICAL WORK AND THE PEOPLE I SUPERVISED WAS ON PCB'S AT THAT TIME.

Q. WAS IT THEN FROM 1970 TO '75 BASICALLY A SUPERVISIONAL (PHONETIC) POSITION?

A. YES. I HAD A NUMBER OF PEOPLE THAT I TAUGHT HOW TO DO WHAT I LEARNED HOW TO DO, AND WE -- I THINK AT SOME POINT IN TIME I HAD AS HIGH AS 11 OR MORE PEOPLE THAT WERE DOING PCB ANALYSIS. I ALSO PROVIDED SUPPORT TO THE MEDICAL DEPARTMENT, TO THE -- IF WE HAD TO GO AND TALK WITH A GOVERNMENT AGENCY AND EXPLAIN WHAT WAS GOING ON, WHICH WE DID QUITE FREQUENTLY, I WOULD GO ALONG AS PART OF THAT TEAM TO EXPLAIN THE CHEMISTRIES, TO EXPLAIN WHAT WE KNEW, AND TO OFFER THE INFORMATION TO THE FOLKS AND ANSWER ANY QUESTIONS THEY MIGHT HAVE.

Q. DID YOU EVER MEET WITH ANY ADEM PERSONNEL?

A. WOULD YOU -- WHAT DO YOU MEAN BY "ADEM"?

A. ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, I BELIEVE IS WHAT IT STANDS FOR.

A. OKAY. NO.

Q. DID YOU EVER MEET WITH ANY EPA PERSONNEL REGARDING THE ANNISTON PLANT?

A. NOT REGARDING THE ANNISTON PLANT SPECIFICALLY, NO.

Q. HOW DID YOUR DUTIES CHANGE WHEN YOU BECAME A RESEARCH SPECIALIST/STAFF CONSULTANT IN 1975?

A. BY THAT TIME I'D FAIRLY WELL ESTABLISHED THE TECHNIQUE, AND THE ANALYSIS THING WAS GETTING -- GOING ALONG QUITE WELL, AND SO I SPENT A LOT MORE TIME INTERACTING WITH GOVERNMENT AGENCIES AND EXPLAINING THE ISSUES AND WORKING WITH THE VARIOUS BUSINESS GROUPS. ALSO THE ORGANIC DIVISION MANUFACTURED 3600 DIFFERENT ORGANIC PRODUCTS INCLUDING PCB'S, AND IT BECAME EVIDENT TO US AT THAT TIME THAT SOME OF THOSE PRODUCTS MIGHT HAVE SOME OF THE SAME CHARACTERISTICS AS PCB'S THAT PEOPLE WERE POINTING OUT MIGHT NOT BE DESIRABLE FROM AN ENVIRONMENTAL VIEWPOINT. SO I REALLY BEGAN FOCUSING ON DEVELOPING TECHNIQUES FOR ESTIMATING THE BIODEGRADABILITY OF MATERIALS, THE BIOACCUMULATION OF MATERIALS, AND BEGAN TO DO STUDIES TO RELATE THOSE PROPERTIES. FIRST OF ALL WE HAD TO DEVELOP THE TECHNIQUES TO DO IT BECAUSE MOST OF THOSE KINDS OF TECHNIQUES THAT EXISTED WERE FOR WATER-SOLUBLE MATERIALS, AND MOST OF THE COMPOUNDS WE WERE TALKING ABOUT WERE NOT WATER SOLUBLE. SO YOU HAD TO DEVELOP

THE WHEREWITHAL OF GETTING THE MATERIALS IN A FORM THAT COULD BE EXPOSED TO BACTERIA AND THOSE KINDS OF THINGS, DEVELOP THE TESTS, SHOW THEIR VALIDITY. AND THEN ONCE WE HAD DONE THAT THEN WE TOOK THOSE TESTS AND BEGAN TO LOOK AT ALL OF OUR PRODUCTS, AND OF COURSE WE DEVELOPED A PRIORITY LIST BASED ON THE CHEMICAL PROPERTIES AS WE UNDERSTOOD THEM AT THE TIME. AND THEN WE BEGAN TO TEST THOSE TO DETERMINE THEIR DEGREE OF BIODEGRADABILITY. WE BEGAN TO TAKE THAT INFORMATION AND ASSOCIATE IT WITH THE MOLECULAR STRUCTURE AND CHARACTERISTICS OF THE COMPOUNDS SO THAT WE COULD BUILD THOSE KINDS OF THINGS INTO IT SHOULD IT BECOME DESIRABLE. WE BEGAN TO TRY TO UNDERSTAND IN MUCH MORE DEPTH WHAT HAPPENED TO PCB'S AS THEY WENT THROUGH THE ENVIRONMENT AND AS THEY WERE WEATHERED AND AS THEY WERE METABOLIZED AND AS THEY UNDERWENT BIOTRANSFORMATION AND THOSE KINDS OF THINGS. AND AS AN ANALYTICAL CHEMIST -- AND ANALYTICAL CHEMISTRY PLAYED A BIG ROLE IN IT BECAUSE YOU HAD TO USE THOSE TECHNIQUES TO MONITOR WHAT WAS GOING ON. THAT'S WHERE MY INTEREST TURNED.

Q. WHAT STUDIES DID YOU -- FIRST OF ALL, WHAT WAS YOUR INVOLVEMENT IN THE STUDIES TO DETERMINE THE BIODEGRADABILITY OF PCB'S?

A. WELL, WE HAD A AGRICULTURAL DIVISION AND WE HAD A

DIVISION THAT MANUFACTURED SOAP PRODUCTS, AND MONSANTO HAD A GENTLEMAN NAMED DR. ROBERT SWISHER -- I'M NOT SURE IF BOB IS ALIVE TODAY, BUT HE WAS PROBABLY ONE IN THE FOREFRONT OF DEVELOPING BIODEGRADATION TECHNIQUES FOR STUDYING SURFACTANTS AND SOAP BUILDERS AND THINGS OF THAT SORT. AND I WORKED WITH BOB SWISHER TO TAKE THE TECHNIQUES THAT HE HAD DEVELOPED AND TO TRY TO APPLY THOSE TECHNIQUES TO WATER-INSOLUBLE COMPOUNDS AND TO TRY TO DEVELOP SCREENING METHODOLOGY WHERE YOU COULD USE BACTERIA TO DETERMINE THE RELATIVE DEGREE OF THE BIODEGRADABILITY OF A PRODUCT OR A MOLECULAR STRUCTURE.

Q. NOW, WHEN YOU'RE TALKING BIODEGRADATION, YOU'RE TALKING MAINLY IN AQUATIC CIRCUMSTANCES?

A. MAINLY IN -- WELL, ACTUALLY THE TESTS WE USED WERE -- ONE CALLED THE RIVER DIE AWAY TEST. WE USED TO GET VIABLE RIVER WATER FROM A SOURCE. I THINK WE USED THE MERAMAC, WHICH IS A RIVER CLOSE TO THE TECH CENTER IN ST. LOUIS. AND WE WOULD TAKE THAT AND THEN WE'D SPIKE IT WITH THE COMPOUNDS AT VERY LOW LEVELS, AND THEN WE'D MONITOR THE DISAPPEARANCE OF THE COMPOUNDS, AND SOMETIMES WE MIGHT EVEN MONITOR THE METABOLITES. SO THE NATURALLY PRESENT -- WE'D MONITOR THE CAPABILITY OF THE NATURALLY PRESENT

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BACTERIA THAT WEREN'T BEING FORTIFIED TO DEGRADE THE MATERIAL, AND THEN WE WOULD TAKE -- WE TOOK A TEST CALLED A SEMI-CONTINUOUS ACTIVATED SLUDGE TEST, WHICH WAS A STANDARD TEST THAT WAS USED TO EVALUATE SURFACTANTS TO DETERMINE THEIR BIODEGRADABILITY. AND WE TOOK THOSE SAME TESTS AND ADOPTED THEM IN MANNER AND DEVELOPED AN UNDERSTANDING THAT ALLOWED US TO USE THOSE TESTS TO STUDY WATER-INSOLUBLE COMPOUNDS AND TO MONITOR THE ACTUAL DEGRADATION AND METABOLIC PRODUCTS AND THE DISAPPEARANCE RATES. WE ALSO USED ANOTHER TEST THAT WAS MORE OF A COMPLETE MINERALIZATION TEST WHERE THE MATERIAL WAS SPIKED IN AN AQUEOUS MEDIA AND INOCULATED WITH A GENERAL POPULATION BACTERIA, AND THEN YOU MONITORED THE CONVERSION OF THAT MATERIAL TO MINERAL SALTS AND CARBON DIOXIDE. UP UNTIL THAT POINT IN TIME NONE OF THOSE TESTS HAD BEEN USED TO STUDY WATER-INSOLUBLE MATERIALS LIKE WE WERE LOOKING AT BECAUSE NOBODY HAD ANY REASON TO BELIEVE THAT THEY WERE OUT THERE UNTIL WE DISCOVERED -- YOU KNOW, WORKED WITH THE TECHNIQUES TO SEE THAT THEY WERE OUT THERE. AT THAT POINT IN TIME WE BEGAN TO USE IT -- DEVELOP IT TO THE POINT WHERE WE COULD USE IT AS A GENERAL SCREENING TECHNOLOGY FOR PRODUCTS. WE SHARED THAT INFORMATION, PUBLISHED THAT INFORMATION. AT ONE

POINT I HAD A PH.D. AND SERO-CHEMIST THAT DID NOTHING BUT SEMI-CONTINUOUS ACTIVATED SLUDGE TESTING OF PRODUCTS AND RIVER DYE WAY TESTING OF PRODUCTS AND COMPLETE MINERALIZATION OF PRODUCTS OVER A LONG PERIOD OF TIME.

Q. WHEN YOU SAY LOW LEVELS, ARE WE TALKING PART-PER-BILLION LEVELS?

A. IN GENERAL, BECAUSE MOST THE MOLECULES WE WERE DEALING WITH WERE NOT SOLUBLE AT THE PART-PER-MILLION LEVEL. THEY WERE REALLY SOLUBLE AT THE PART-PER-BILLION LEVEL.

Q. AND WE'RE TALKING PROBABLY LOW PART-PER-BILLION LEVEL; IS THAT RIGHT?

A. IN SOME INSTANCES, CERTAINLY. IT DEPENDED UPON THE INDIVIDUAL STRUCTURE OF THE COMPOUND/CHEMICAL.

Q. WHAT WERE YOU ABLE TO DETERMINE WITH THE BIODEGRADABILITY OF PCB'S?

A. WE WERE ABLE TO DETERMINE THAT PCB'S BIODEGRADED, AND THAT INFORMATION WAS PUBLISHED.

Q. AT WHAT RATE DO THEY BIODEGRADE?

A. IT REALLY DEPENDS ON THE MOLECULAR STRUCTURE AND THE DEGREE OF CHLORINATION. SOME DISAPPEAR ALMOST IMMEDIATELY ON A REAL-TIME BASIS, AND OTHERS PROBABLY HAVE VERY, VERY LONG HALF-LIVES IN THE ENVIRONMENT DEPENDING UPON WHAT THEY'RE EXPOSED TO

AND HOW THEY'RE EXPOSED TO IT.

Q. WHICH ONES DISAPPEAR VERY READILY?

A. WE FOUND THAT ON A GROSS BASIS THAT THE BIODEGRADABILITY WAS ASSOCIATED OR CORRELATABLE WITH THE DEGREE OF CHLORINATION. SO BIPHENYL ITSELF DISAPPEARS ALMOST IMMEDIATELY. MONOCHLOROBIPHENYLS, THEY ALSO DISAPPEAR ALMOST IMMEDIATELY. DICHLOROBIPHENYLS DISAPPEAR BUT NOT IMMEDIATELY. TRI'S, A LOT OF THOSE GO PARTICULARLY FAST, BUT SOME DON'T. TETRA'S, AGAIN THERE'S A PROGRESSION TOWARD LONGER HALF-LIVES IN THE ENVIRONMENT UNDER THE CIRCUMSTANCES THAT WE STUDIED, THE CONDITIONS WE STUDIED, TO THE POINT WHERE SOMETHING LIKE DECACHLOROBIPHENYL, WHICH IS THE HIGHEST CHLORINATION THAT YOU CAN HAVE -- WHICH WAS NEVER A PRODUCT THAT WAS MANUFACTURED -- PROBABLY IS AROUND A LONG TIME WHEN IT'S EXPOSED TO A COMMON BACTERIA, FOR A COUPLE OF REASONS. IT'S WATER SOLUBILITY IS PROBABLY THE LOWEST OF ANY OF THE GROUP AND HAVING ALL OF THE TEN POSITIONS ON THE TWO PHENOL RINGS OCCUPIED WITH CHLORINE SO IT INSULATES IT FROM BACTERIA. AND IT'S A DIFFERENT KIND OF COMPOUND THAN BACTERIA ARE USED TO SEEING, SO THEY DON'T NECESSARILY HAVE THE ENZYME MECHANISM FOR DEALING WITH THAT COMPOUND AND USING IT AS AN ENERGY SOURCE

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OR A CARBON SOURCE. IT DOESN'T MEAN THAT THEY CAN'T DEVELOP IT, THOUGH.

Q. NOW, IS THERE ALSO A VARIABILITY IN THE MONO ISOMERS THEMSELVES?

A. NOT REALLY, AND THE REASON IS, IS THAT A MONOCHLOROBIPHENYL -- THERE ARE TEN POSITIONS ON THE TWO PHENOL RINGS. FIVE POSITIONS ON EACH RING ARE EQUIVALENT, SO THERE'S TWO OF EVERY POSITION ON THE BIPHENYL MOLECULES, SO -- AND THE CHLORINE CAN ONLY OCCUPY ONE OF THOSE, SO THAT WOULD BE THE ONLY POSITION IT COULD BLOCK. AND THE SENSITIVITY -- IF YOU LOOKED AT IT CLOSELY ENOUGH, YOU MIGHT SEE DIFFERENCES, BUT THEY DISAPPEAR SO RAPIDLY THAT IT'S NOT IMPORTANT. AS LONG AS ONE RING HAS NO CHLORINES IN IT, IT GOES QUITE FAST. AND WITH MONOCHLOROBIPHENYL, OBVIOUSLY BOTH RINGS CAN'T HAVE A CHLORINE IN IT.

Q. WHAT ABOUT THE BI AND THE TRI, CAN YOU SEPARATE THE ISOMERS?

A. THERE HAS PROBABLY BEEN SOME WORK DONE. THE TREND THAT DEVELOPED WAS THAT IF YOU HAD BOTH THE CHLORINES IN ONE RING, THAT LEFT THE OTHER RING COMPLETELY EXPOSED FOR BACTERIAL DEGRADATION, SO IT PROBABLY WENT QUITE QUICKLY. WE'RE TALKING ABOUT PRIMARY DEGRADATION. IF YOU PUT A CHLORINE IN EACH

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RING, WELL, THAT MIGHT SLOW IT DOWN A LITTLE BIT. AND THAT'S THE WAY IT WENT.

Q. DID YOU DO ANY OTHER STUDIES BESIDES BIODEGRADATION? ANY OTHER DEGRADATION STUDIES LIKE PHOTODEGRADATION?

A. WELL, WE DID SOME PHOTODEGRADATION. WE ALSO DID THINGS LIKE TAKING BIPHENYL AND PUTTING IT IN WATER AND TREATING IT WITH BLEACH TO SEE WHETHER OR NOT PCB'S COULD BE PRODUCED THAT WAY. WE DID A LOT OF EXPERIMENTS TO TRY AND DETERMINE WHERE PCB'S ARE REALLY COMING FROM BECAUSE AT THAT POINT IN TIME NOBODY REALLY UNDERSTAND -- UNDERSTOOD THE WAY CHEMICALS INTERACTED WITH THE ENVIRONMENT WELL ENOUGH TO BELIEVE THAT THINGS WERE BEING DISTRIBUTED AROUND THAT WAY WHEN THEY WEREN'T INTENTIONALLY DISTRIBUTED AROUND THAT WAY. AS A MATTER OF FACT, WITH BLEACH WE FOUND THAT YOU COULD ACTUALLY TAKE BIPHENYL IN WATER WITH BLEACH AND FORM MONOCHLOROBIPHENYL.

WHAT ELSE DID WE DO. WE ALSO BEGAN TO ANALYZE THE TISSUE RESIDUES AND BEGAN TO ASCERTAIN THE DISTRIBUTION OF PCB'S IN THE VARIOUS ORGANS IN ANIMAL. WE DETERMINED THE LEVELS THAT WENT THROUGH THE ANIMAL, THE LEVELS THAT WERE RETAINED BY THE ANIMAL. WE PUT ALL OF THOSE RESULTS TOGETHER WITH EVERYTHING WE KNEW ABOUT THE BIODEGRADATION AND

THINGS OF THAT SORT AND EVENTUALLY, ON A VOLUNTARY BASIS, PRESENTED ALL OF THAT INFORMATION TO THE PRESIDENT'S COUNCIL ON ENVIRONMENTAL QUALITY TO BRING THEM UP TO SPEED IN TERMS OF WHAT PCB'S WERE AND WHAT WE WERE FINDING OUT ABOUT THEM.

Q. WHEN YOU SAID YOU DID A LOT OF STUDIES TO DETERMINE WHERE PCB'S CAME FROM, WHERE DID YOU ULTIMATELY CONCLUDE THAT THEY CAME FROM IN THE ENVIRONMENT?

A. THE ULTIMATE CONCLUSION WAS THAT THE BULK OF THE PCB'S IN THE ENVIRONMENT CAME FROM THE MANUFACTURE AND USE OF THE MATERIALS BUT PRIMARILY FROM THE USE.

Q. AND HOW DID YOU REACH THAT CONCLUSION?

A. BY LOOKING FOR ALL SORTS OF OTHER SOURCES OF THE MATERIALS, BY LOOKING FOR ALL SORTS OF NATURAL SOURCES, BY LOOKING AT OTHER TYPES OF CHLORINATED PRODUCTS TO SEE WHETHER OR NOT THERE COULD BE CONTAMINANTS IN THOSE PRODUCTS -- BYPRODUCTS THAT WOULD BE PCB'S. AND IN FACT THERE ARE SOME INSTANCES WHERE PCB'S ARE BYPRODUCT, AND THERE'S AN ACTUAL TEST FOR BYPRODUCT PCB'S IN DYES AND THINGS OF THAT SORT. SO THERE ARE SOME OTHER SOURCES OF PCB'S IN THE ENVIRONMENT. I'M ALSO QUITE SURE THAT THERE MAY BE SOURCES FROM OTHER CHLORINATED MATERIALS IN THE ENVIRONMENT, BUT THERE WAS NO QUESTION THAT ULTIMATELY, YOU KNOW -- THIS IS 1999,

AND IN THE -- I FORGET WHEN WE VOLUNTARILY QUIT MANUFACTURING PCB'S. I THINK IT WAS IN THE SEVENTIES, THE MID SEVENTIES OR SO. WE WERE FAIRLY CONVINCED THAT PCB'S THAT WERE BEING FOUND IN THE ENVIRONMENT WERE THE RESULTANT OF THE END USE OF THE PRODUCT.

Q. AND CAN WE AGREE THAT MONSANTO WAS THE ONLY MANUFACTURER IN THE UNITED STATES? IS THAT CORRECT?

A. THAT'S CORRECT. MONSANTO WAS THE SOLE U.S. MANUFACTURER OF PCB'S. I THINK IT'S ONLY FAIR TO POINT OUT THAT WORLDWIDE THERE WERE MANY MANUFACTURERS OF PCB'S. THE GERMANS MANUFACTURED THEM. THE RUSSIANS MANUFACTURED THEM. THE FRENCH MANUFACTURED THEM. THEY WERE MANUFACTURED IN THE U.K. THE JAPANESE MANUFACTURED THEM. THE RUSSIANS CERTAINLY HAS MULTIPLE CAPABILITY FOR MANUFACTURING THEM. BUT IN THE UNITED STATES MONSANTO WAS THE SOLE U.S. MANUFACTURER.

Q. AND WOULD IT BE SAFE TO ASSUME, THEN, THE ULTIMATE SOURCE OF THE PCB'S FOUND IN THE UNITED STATES WOULD BE FROM MONSANTO MANUFACTURING?

A. AS I STATED EARLIER, THE SOURCE OF PCB'S WAS THEIR MANUFACTURE. THE SOURCE OF THE PCB'S AND THE DISTRIBUTION OF THE PCB'S IN THE ENVIRONMENT WERE AS A RESULT OF THEIR END USE. PCB'S WERE USED AS

COMPONENTS IN THE MANUFACTURE OF MANY OTHER PRODUCTS. THEY WERE USED AS DIELECTRIC FLUIDS FOR CAPACITORS AND TRANSFORMERS. THEY WERE USED AS HYDRAULIC FLUIDS IN APPLICATIONS WHERE FIRE-RETARDANT WAS REQUIRED SO THAT PLANTS DIDN'T BURN DOWN. IN THE TRANSFORMERS THEY WERE USED AS DIELECTRIC FLUIDS TO KEEP THEM FROM EXPLODING AND TO ALLOW YOU TO USE THEM AROUND PEOPLE SO THAT YOU WOULDN'T ENDANGER PEOPLE AND HAVE TO DO SPECIAL THINGS. PCB'S WERE A VERY STABLE, VERY USEFUL MOLECULE, AND AT THE POINT IN TIME THEY WERE THOUGHT TO BE TOTALLY INNOCUOUS, WITH NO PROBLEMS ASSOCIATED WITH THEM, THEY WERE USED FOR A VARIETY OF THINGS. THE PCB'S IN THE ENVIRONMENT ARE FOUND IN THE ENVIRONMENT BECAUSE OF THE DISTRIBUTION THROUGH THEIR USE.

Q. NOT ALL OF THEM, THOUGH?

A. I THOUGHT YOU SAID THE BULK OF THE PCB'S IN THE ENVIRONMENT.

Q. MY QUESTION ---

A. CERTAINLY NOT ALL OF THEM.

Q. MY QUESTION WAS, IS THAT THE BULK OF THE PCB'S THAT YOU CAN FIND IN THE UNITED STATES IN THE ENVIRONMENT WERE ULTIMATELY MANUFACTURED BY MONSANTO.

A. WERE INITIALLY MANUFACTURED BY MONSANTO. OKAY.

Q. YOU CAN AGREE WITH THAT?

A. AND SOLD TO CUSTOMERS, YES. BUT I GUESS WHAT I OBJECT TO REALLY IS THE IMPLICATION THAT THE MANUFACTURE OF PCB'S WAS THE CAUSE OF THE DISTRIBUTION. THE CAUSE OF THE DISTRIBUTION WAS THE FACT THAT THEY WERE USED -- THEY WERE SO USEFUL AND THEY WERE USED BY SO MANY OTHER PEOPLE AS COMPONENTS IN OTHER PRODUCTS FOR A VARIETY OF REASONS.
BUT I'LL ANSWER YOUR QUESTION. ULTIMATELY IN THE UNITED STATES THE PCB'S WERE PROBABLY MANUFACTURED BY MONSANTO. THEY WERE THE SOLE U.S. MANUFACTURER OF PCB'S.

Q. WOULD YOU AGREE WITH ME THAT AS THE MANUFACTURER OF A PRODUCT YOU HAVE THE DUTY TO DETERMINE IF IT'S SAFE OR NOT?

A. ABSOLUTELY.

BY MR. PRAUSE:

ARE YOU TALKING ABOUT TODAY?

BY MR. FELL:

TODAY. ANY DAY.

BY MR. PRAUSE:

WELL, WHY DON'T YOU BE SPECIFIC WITH HIM.

DIRECT EXAMINATION RESUMED BY MR. FELL:

Q. BACK WHEN MONSANTO ---

BY MR. PRAUSE:

I OBJECT TO THE FORM OF THE QUESTION TO THE EXTENT IT CALLS FOR A LEGAL CONCLUSION ALSO.

DIRECT EXAMINATION RESUMED BY MR. FELL:

Q. WHEN MONSANTO MANUFACTURED PCB'S BACK IN THE 1940'S AND '50'S, WASN'T IT THE DUTY OF THE MANUFACTURER TO MANUFACTURE A SAFE PRODUCT?

A. YES.

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION.

DIRECT EXAMINATION RESUMED BY MR. FELL:

Q. YOU INDICATED THAT ULTIMATELY YOU CONCLUDED THAT PCB'S DO BIODEGRADE; IS THAT CORRECT?

A. THAT'S CORRECT.

Q. WOULD YOU AGREE WITH ME THAT THEY ULTIMATELY BIODEGRADE AT A FAIRLY SLOW RATE AS COMPARED TO ANY OTHER CHEMICALS?

A. NO, I WOULDN'T AGREE WITH YOU ON THAT. WHAT I WOULD SAY TO YOU IS THAT, FOR EXAMPLE, DDT DOESN'T BIODEGRADE VERY RAPIDLY, AND SO DDT IS AN "OTHER" CHEMICAL. HEXACHLOROBENZENE IS AN "OTHER" CHEMICAL. THERE ARE A LOT -- CHLORINATED NAPHTHALENES, CHLORINATED HYDROCARBONS. THERE ARE A LOT OF OTHER CHEMICALS THAT HAVE LIFETIMES JUST AS LONG AS PCB'S IN THE ENVIRONMENT. A LOT OF THOSE CHEMICALS -- FOR EXAMPLE, THE CHLORINATED NAPHTHALENES AND THE

CHLORINATED HYDROCARBONS -- CAN'T BE DETECTED AS WELL BY ELECTRON CAPTURE AS PCB'S CAN, SO -- THE DIRECTION YOU'RE GOING IS FINE. ON A SCALE OF ONE TO TEN PCB'S HAVE BIODEGRADABILITY FROM ONE TO TEN. IT DEPENDS ON WHETHER YOU'RE DEALING WITH BIPHENYL OR DECACHLOROBIPHENYL.

Q. WHAT WERE THE -- HOW DID YOU DETERMINE HALF-LIVES? DID YOU DETERMINE THEM AS OF MONO, DI, TRI, OR 1242, 1260?

A. THE HALF-LIVES WERE DETERMINED AS -- WERE DETERMINED AND REPORTED IN THE ARTICLE I PUBLISHED AS HALF-LIVES FOR THE PRODUCTS THEMSELVES.

Q. OTHER THAN THE BIODEGRADATION STUDIES THAT YOU TALKED ABOUT, DID YOU PERFORM ANY OTHER BIODEGRADATION STUDIES?

A. YOU MEAN ANY LABORATORY DEGRADATION STUDIES, YOU KNOW, WHERE WE WERE TRYING TO DEVELOP TECHNIQUES FOR DETERMINING WHAT WAS GOING ON?

Q. YES.

A. NO. MY PRIMARY FOCUS WAS IN, AS I SAID, THE ANALYTICAL CHEMISTRY AREA. SO IF ANALYTICAL CHEMISTRY WAS THE DOMINANT TECHNIQUE THAT WAS REQUIRED AND THAT REQUIRED THE MOST SKILL, THEN GENERALLY I HAD TO DO WITH THE PROJECT. AND SO BIODEGRADABILITY USING SEMI-CONTINUOUS ACTIVATED

SLUDGE, RIVER DYE WAY, COMPLETE MINERALIZATION AND METABOLISM, AND WHAT WAS IN THE TISSUES AND THINGS OF THAT SORT WERE THE PRIMARY THINGS THAT I LOOKED AT IN TERMS OF BIOTRANSFORMATION.

Q. WHAT RESEARCH DID YOU DO IN THE BIOACCUMULATION AREA?

A. THE RESEARCH INVOLVED STUDYING THE RATE AT WHICH PCB'S ACCUMULATED IN AQUATIC, AVIAN, AND MAMMALIAN SPECIES THAT WERE DELIBERATELY FED PCB'S.

Q. NOW, WERE YOU IN CHARGE OF THE WHOLE PRODUCT, OR WERE YOU BASICALLY OVER THE ANALYTICAL CHEMISTRY INVOLVED?

A. THE WHOLE PRODUCT?

Q. THE WHOLE ---

A. PROJECT?

Q. --- PROJECT.

A. NO. I JUST PROVIDED THE ANALYTICAL SUPPORT. I WOULD, FOR EXAMPLE -- THE TOXICOLOGY STUDY HAS A CERTAIN FORM AND FORMAT AND A STANDARD OPERATING PROCEDURE ASSOCIATED WITH IT. IF IT WAS A 30-DAY STUDY, FOR EXAMPLE, IT WOULD BE OVER A 30-DAY PERIOD AND THEY'D SAY, "WELL, YOU KNOW, WHAT DO YOU NEED TO MONITOR WHAT'S IN THE TISSUES AND HOW FREQUENTLY DO YOU WANT TO MONITOR WHAT'S IN THE TISSUES?" BECAUSE THEY MIGHT EXPOSE THE ANIMAL FOR 30 DAYS AND THEN

SACRIFICE IT AT THE END OF 30 DAYS AND LOOK AT DIFFERENT -- WEIGHT GAIN, WEIGHT LOSS -- A VARIETY OF THINGS THAT TOXICOLOGISTS -- ANIMAL TOXICOLOGISTS LOOK AT. SO I WOULD SAY, "WELL, YOU KNOW, YOU'RE GOING TO HAVE TO ADD THIS MANY EXTRA ANIMALS UP-FRONT BECAUSE I'D LIKE TO SACRIFICE TWO OR THREE EVERY FIVE DAYS," BECAUSE I NEEDED THAT MUCH TISSUE TO DETECT THE PCB'S IF THEY WERE GOING TO BE PRESENT IN THERE. AND SO I WOULD PARTICIPATE IN THOSE STUDIES TO DESIGN THE EXTRA THAT WAS NEEDED TO ALLOW ME TO DO THE ANALYSIS AND TO PROVIDE THE SAMPLES THAT I NEEDED.

Q. WHAT DID YOU CONCLUDE FROM THE BIOACCUMULATION STUDIES?

A. WE CONCLUDED -- THERE WERE SEVERAL CONCLUSIONS. THEY WERE ALL PUBLISHED AND THEY WERE ALL SHARED, AND IT WAS PART OF THE INTERDEPARTMENTAL -- THE TASK FORCE PRESENTATION THAT WE MADE. WHAT WE FOUND WAS THAT RANGING FROM BIPHENYL TO DECACHLOROBIPHENYL THAT THE DEGREE OF CHLORINATION -- THE HIGHER THE DEGREE OF CHLORINATION THE MORE LIPID-SOLUBLE THEY ARE, SO THE MORE THEY ACCUMULATE THE HIGHER THE CONCENTRATION FACTORS. WE FOUND THAT THE LOWER-CHLORINATED ISOMERS EITHER WERE CONJUGATED OR METABOLIZED OR SOMETIMES HANDLED AND EXCRETED.

HOWEVER, WE ALSO FOUND THAT THE LEVELS THAT MOST CHRONIC SHORT-TERM TOXICITY TESTS ARE DONE, THAT THEY WERE OVERWHELMING THE ANIMALS SYSTEMS, AND WE FOUND JUST UNALTERED MATERIALS SOMETIMES, SO THAT THE ISOMER DISTRIBUTION OR THE PATTERN THAT YOU'D SEE WOULD CHANGE.

Q. IN OTHER WORDS, YOU WOULDN'T FIND 1242 OR 1260 IN THE ANIMAL; IS THAT CORRECT?

A. THERE ARE INSTANCES WHERE YOU WOULD NOT. THAT'S CORRECT.

Q. SO JUST AS THE BIODEGRADATION WOULD AFFECT CERTAIN ISOMERS, BIOACCUMULATION WOULD CONCENTRATE CERTAIN ISOMERS?

A. MORE THAN OTHERS, YES.

Q. AND GENERALLY YOU'RE SAYING THAT YOUR STUDIES FOUND THAT IT BIOACCUMULATED THE HIGHER-CHLORINATED ISOMERS. IS THAT A ---

A. THE HIGHER THE DEGREE OF CHLORINATION THE HIGHER THE BIOACCUMULATION.

Q. IS THAT TRUE ACROSS THE BOARD?

A. THERE PROBABLY ARE INSTANCES WHERE A TRICHLORAL ISOMER OR OCTACHLORAL ISOMER -- ONE CAN BE A LITTLE BIT MORE LIPID-SOLUBLE THAN THE OTHER BUT PROBABLY NOT MANY INSTANCES. IT WOULDN'T HAVE TO DO, NECESSARILY, WITH LIPID SOLUBILITY. IT WOULD HAVE

TO DO WITH AVAILABLE SITES FOR CONJUGATION AND/OR METABOLISM.

BY THE VIDEOGRAPHER:

I NEED TO CHANGE TAPES.

BY MR. FELL:

SURE. GO AHEAD. PERFECT TIMING.

(SHORT BREAK)

DIRECT EXAMINATION RESUMED BY MR. FELL:

Q. I BELIEVE WE HAD TALKED ABOUT SEVERAL RESPONSES WHICH YOU'VE PARTICIPATED IN WHICH MONSANTO HAS HAD TO THE DISCOVERY BY THE SWEDES OF PCB'S IN THE ENVIRONMENT. IS THAT CORRECT?

A. YES.

Q. SO FAR WE'VE TALKED ABOUT, ONE, THE DEVELOPMENT OF ANALYTICAL TECHNIQUES CAPABLE OF DETECTING PCB'S IN THE PART-PER-MILLION/PART-PER-BILLION LEVEL; IS THAT CORRECT?

A. WE DID TALK ABOUT THAT, YES.

Q. AND THAT'S USING THE ELECTRON CAPTURE FIRST AND THEN ULTIMATELY THE MASS SPEC; IS THAT CORRECT?

A. RIGHT. BOTH WITH GAS CHROMATOGRAPHS AS THE UP-FRONT SEPARATION TECHNIQUE THAT DELIVERS THE MATERIAL TO THE DETECTOR.

Q. THEN WE ALSO TALKED ABOUT THE IDENTIFICATION OF MIXTURES OF THE DIFFERENT PRODUCTS THAT YOU HAD; IS

THAT CORRECT?

A. YES, WE DID TALK ABOUT THAT.

Q. AND THEN WE ALSO TALKED ABOUT MONSANTO TRYING TO DETERMINE HOW THE PRODUCT ACTUALLY GOT INTO THE ENVIRONMENT; IS THAT CORRECT?

A. CORRECT.

Q. AND YOU ALSO TALKED ABOUT ANOTHER RESPONSE THAT YOU WERE INVOLVED IN THAT YOU DID SOLUBILITY STUDIES; IS THAT CORRECT?

A. CORRECT.

Q. FOR PCB'S.

YOU DID BIOACCUMULATION AND BIODEGRADATION STUDIES OF PCB'S?

A. YES, WE DID.

Q. WHAT OTHER RESPONSES WERE YOU INVOLVED IN WITH MONSANTO TO THE PCB PROBLEM?

A. WELL, AS I SAID, WE TOOK THE KNOWLEDGE THAT WE LEARNED FROM THE PCB EXAMPLE AND BEGAN TO USE THAT AS SCREENING TECHNOLOGY FOR ALL OF THE EXISTING PRODUCTS. WE ALSO BEGAN TO USE THOSE AS A BASIS FOR SCREENING TECHNOLOGY FOR NEW PRODUCTS. SO WE HAD -- WE BECAME CONCERNED ABOUT BIODEGRADABILITY WHEN PREVIOUSLY NOBODY IN THEIR RIGHT MIND WAS CONCERNED ABOUT BIODEGRADABILITY BECAUSE EVERYBODY KNEW THE COMPOUNDS WEREN'T WATER-SOLUBLE, SO, THEREFORE, IN

THE CLASSICAL SENSE THEY WEREN'T AN ISSUE FROM THAT VIEWPOINT.

WE BEGAN TO -- AS IT BECAME EVIDENT, AS MORE AND MORE KNOWLEDGE CAME AROUND, WE BEGAN TO LOOK FOR SUBSTITUTES. INITIALLY WE FOUND THAT SOME APPLICATIONS BY THE PEOPLE THAT WE SOLD THE MATERIAL TO WERE LEAKY AS FAR AS THE ENVIRONMENT WAS CONCERNED. WHILE THEY WEREN'T INTENTIONALLY SPREADING THEM AROUND, THEY PUT THEM IN PRODUCTS THAT PEOPLE USED, AND DURING THE USE OF THOSE PRODUCTS THEY SPREAD THEM AROUND. AS IT BECAME MORE OF A FEELING THAN A REALITY THAT IT WASN'T A GOOD IDEA TO HAVE THEM AROUND IN THE ENVIRONMENT THERE BECAME THE MOVEMENT TOWARD TRYING TO FIND ADEQUATE SUBSTITUTES, ESPECIALLY IN THOSE APPLICATIONS WHERE THE DISTRIBUTION WAS INHERENT IN THE PRODUCT END USE. ALSO ULTIMATELY -- AND WE'RE TALKING -- WE'RE NOT TALKING DAYS. WE'RE TALKING YEARS HERE. IT BECAME EVIDENT THAT SAFE, ALTERNATE SUBSTITUTES NEEDED TO BE DEVELOPED FOR THE END USES THAT REQUIRED THE FIRE-RETARDANT CAPABILITIES OF PCB'S, THE NON-EXPLOSIVE PROPERTIES OF THE PCB'S, AND THINGS OF THAT SORT. SO AS THOSE PRODUCTS WERE THOUGHT ABOUT BY THE ORGANIC CHEMISTS AND THINGS OF THAT SORT, WE NEEDED TO DEVELOP THE METHODOLOGY TO

MEASURE THEM, TO SCREEN THEM, TO MAKE SURE THAT THEY DIDN'T HAVE WHAT SOME PEOPLE WERE FEELING WERE UNDESIRABLE PROPERTIES OF THE CHEMICALS -- PCP'S, DDT, THINGS OF THAT SORT.

I'M TRYING TO ---

Q. I'M LOOKING MORE FOR PCB -- THINGS DEALING WITH PCB'S.

WHAT ABOUT DEALING WITH DIOXINS AND FURANS?

A. THERE WAS A POINT AT WHICH -- I BELIEVE IT HAPPENED AFTER THE YOSHU (PHONETIC) INCIDENT. THE YOSHU INCIDENT, AS I RECALL, INVOLVED -- SOMEHOW OR ANOTHER THE JAPANESE MANUFACTURED A PRODUCT CALLED CANICHLOR (PHONETIC), WHICH WAS A PCB, AND IT HAD SOMEHOW BEEN -- RICE OIL HAD SOMEHOW BEEN ADULTERATED WITH THAT MATERIAL. THEY'RE BOTH WHITE OILS. AND THAT MATERIAL HAD BEEN USED AS A COOKING OIL BY THE JAPANESE, AND THEY HAD COOKED A LOT OF FOOD IN IT AND INGESTED IT, AND IT BECAME KNOWN AS THE YOSHU INCIDENT. IT'S MY UNDERSTANDING -- I'M NOT A TOXICOLOGIST. IT'S MY UNDERSTANDING THAT THE KIND OF RESPONSE THAT THEY SAW IN THESE PEOPLE WAS NOT THE RESPONSE THAT THEY EXPECTED OF PEOPLE EXPOSED TO CHRONIC -- TO ACUTE LEVELS OF PCB'S. THERE WERE SOME EFFECTS THAT JUST NOBODY HAD EVER SEEN PREVIOUSLY, AND ULTIMATELY I BELIEVE THAT THOSE

EFFECTS WERE ATTRIBUTED TO DIBENZOFURANS -- CHLORINATED DIBENZOFURANS, WHICH COULD HAVE RESULTED AS TRAMP BYPRODUCTS -- MINOR LEVEL BYPRODUCTS IN THE PRODUCT, DEPENDING UPON HOW IT WAS MANUFACTURED, AND/OR AS THERMAL DECOMPOSITION PRODUCTS WHEN THE MATERIAL WAS USED TO COOK IN THE RICE OIL AND EXPOSED TO HIGH TEMPERATURES AND FLAME. AT ANY RATE, I THINK THE TALL AND SHORT OF IT WAS THAT SOME OF THE THINGS THEY SAW WERE ATTRIBUTED TO DIBENZOFURANS AND THAT KIND OF STUFF. AND THEY BEGAN TO ASK QUESTIONS OF US, AND WE BEGAN TO ASK QUESTIONS OF OURSELVES: "WELL, GEE, ARE THOSE MATERIALS IN OUR PRODUCT?"

WE DEVELOPED THE GC/MASS SPEC CAPABILITY TO DO THAT, VERIFIED THAT WE WERE CAPABLE OF DOING IT, AND LOOKED AT OUR PRODUCTS AS WELL AS A NUMBER OF PRODUCTS THAT WERE MANUFACTURED BY OTHER WORLD -- INTERNATIONAL MANUFACTURERS OF PCB'S.

Q. AND DID YOU IN FACT DETERMINE THAT THE PCB'S MANUFACTURED BY MONSANTO CONTAINED FURANS?

A. MY RECOLLECTION WAS THAT THE PCB'S MANUFACTURED BY MONSANTO CONTAINED LITTLE, IF ANY, FURANS AND THAT THE FOREIGN COMPETITIVE PRODUCTS CONTAINED SIGNIFICANT AMOUNTS.

Q. BUT, NONETHELESS, FURANS WERE FOUND IN MONSANTO

PCB'S?

A. I WOULD HAVE TO REVIEW THE RECORD, BUT I -- YOU KNOW, I REMEMBER WHAT I HAVE RECOLLECTED TO YOU ALREADY. I RECOLLECT THAT OF THE PRODUCTS THAT WE LOOKED AT MONSANTO HAD LITTLE, IF ANY, DIBENZOFURANS IN THE MATERIAL AS MANUFACTURED.

Q. HOW INVOLVED WERE YOU IN THE DETERMINATION OR TESTING OF MONSANTO PCB'S FOR DIOXINS AND FURANS?

A. I WORKED CLOSELY WITH THE INDIVIDUAL IN QUESTION WHO DID THE MASS SPEC ANALYSIS.

Q. AND WHO DID THE MASS SPEC ANALYSIS?

A. A GENTLEMAN NAMED DR. JIM MIEURE.

Q. HOW DO YOU SPELL THAT LAST NAME?

A. M-I-E-U-R-E, I BELIEVE.

Q. WHAT WAS YOUR UNDERSTANDING OF WHETHER DIOXINS WERE FOUND IN MONSANTO PCB'S?

A. IT IS MY UNDERSTANDING THAT THERE WERE NO DIOXINS FOUND IN MONSANTO PCB PRODUCTS, THE AROCLORS, WHICH I THINK YOU'RE REFERRING TO. AND I WOULD HESITATE TO ADD TO YOU THAT THE RING STRUCTURE ASSOCIATED WITH POLYCHLORINATED BIPHENYLS IS NOT A GOOD PRECURSOR FOR DIBENZO DIOXINS, AND IN FACT I DON'T THINK THAT ANYBODY HAS EVER SHOWN THAT IN THE MANUFACTURE OF PCB'S THAT DIOXINS ARE PRESENT. THEY HAVE SHOWN IN THE REFORMATION AT IMPROPER

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TEMPERATURES THAT IF YOU TAKE CHLORINATED MATERIALS, INCLUDING PCB'S OR POLYVINYL CHLORIDE, AND FRAGMENT IT IN A THERMAL OPERATION AND THEN IN THE REFORMATION OF THE FRAGMENTS CAN FORM LOW LEVELS OF DIOXINS, BUT I DON'T THINK THEY'RE PRESENT IN THE PCB PRODUCTS THAT MONSANTO MANUFACTURED.

Q. THAT'S YOUR UNDERSTANDING AND RECOLLECTION?

A. THAT'S MY UNDERSTANDING AND MY RECOLLECTION.

Q. AND, AGAIN, YOU'RE NOT AWARE -- FROM YOUR UNDERSTANDING AND RECOLLECTION YOU'RE NOT AWARE OF FURANS BEING DETECTED IN MONSANTO PCB'S?

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION. IT'S BEEN ASKED AND ANSWERED TWICE.

WITNESS ANSWERS:

A. I BELIEVE WHAT I STATED WAS THAT MY RECOLLECTION WAS THAT WE LOOKED AT PCB'S THAT WERE MANUFACTURED BY MONSANTO AND BY A NUMBER OF INTERNATIONAL MANUFACTURERS -- GERMAN, FRENCH, JAPANESE -- AND THAT WE DID NOT FIND SIGNIFICANT LEVELS OF DIBENZOFURANS IN THE MONSANTO PRODUCTS. WE DID FIND HIGHER LEVELS IN -- LEVELS IN THE OTHER ONES, BUT I DON'T REMEMBER SPECIFICALLY. THAT WAS A LONG TIME AGO. BUT THAT INFORMATION WAS PUBLISHED, AND I'M SURE IT'S AVAILABLE.

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Q. WHAT DO YOU MEAN BY "SIGNIFICANT LEVELS" OF DIBENZOFURANS?

A. I GUESS I WOULD MEAN ANYTHING BUT SUB PART-PER-BILLION LEVELS. AND THE SIGNIFICANCE ASSOCIATED WITH THESE THINGS HAS ALWAYS COME TO ME FROM TOXICOLOGISTS WHO STUDY THE IMPACT OF THESE COMPOUNDS ON MATERIALS, AND THERE ARE A VARIETY OF OPINIONS AVAILABLE, AND I'M SURE THAT THEY'D BE HAPPY TO OFFER THOSE TO YOU.

Q. THAT GETS ME TO MY NEXT QUESTION.

YOU CONSIDER YOURSELF AN EXPERT IN ANALYTICAL CHEMISTRY, OBVIOUSLY.

A. YES, SIR.

Q. YOU DON'T CONSIDER YOURSELF AN EXPERT IN THE AREA OF TOXICOLOGY; IS THAT CORRECT?

A. THAT'S CORRECT. I DO NOT CONSIDER MYSELF AN EXPERT IN THAT AREA.

Q. AND YOU'RE NOT A MEDICAL DOCTOR; IS THAT CORRECT?

A. I CERTAINLY AM NOT A MEDICAL DOCTOR.

Q. AND YOU'RE NOT AN EXPERT ON REMEDIATION OTHER THAN ANALYTICAL TECHNIQUES USED IN REMEDIATION; IS THAT CORRECT?

A. THAT'S CORRECT. I PROVIDE THE ANALYTICAL COMPONENT IN A REMEDIATION TEAM.

Q. DO YOU CONSIDER YOURSELF AN EXPERT IN THE

BIODEGRADATION OF PCB'S?

A. IN TERMS OF THE PAPERS THAT I'VE PUBLISHED AND THE STUDIES THAT I'VE DONE, YES.

Q. AND DO YOU CONSIDER YOURSELF AN EXPERT IN THE AREA OF HOW PCB'S WEATHER IN THE OPEN ENVIRONMENT?

A. IN TERMS OF THE SAMPLES THAT I'VE ANALYZED, THE CHROMATOGRAM I'VE LOOKED AT, AND THE INFORMATION GENERATED AS THE DELIBERATE EXPOSURE OF TEST ANIMALS TO THOSE, YES.

Q. NOW, WE'VE ALREADY TALKED ABOUT BIODEGRADATION WHICH IS -- I BELIEVE, AS WE TALKED ABOUT IT, IS IN AN AQUATIC SETTING. IS THAT CORRECT?

A. THAT'S CORRECT.

Q. AND WE'VE TALKED ABOUT WHAT STUDIES THAT YOU'VE DONE TO DETERMINE THAT: AGAIN, THE RIVER AND THE SLUDGE AND THE MINERAL TEST?

A. CORRECT.

Q. WHAT OTHER STUDIES HAVE YOU USED OR WHAT OTHER EXPERIENCE DO YOU HAVE TO DETERMINE THE EFFECT OF WEATHERING ON, SAY, SOIL SAMPLES NOT IN AN AQUATIC SETTING?

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION.

WITNESS ANSWERS:

A. I'VE NOT DONE ANY WORK WHERE I DELIBERATELY TOOK

SOIL SAMPLES AND PUT PCB'S IN THEM AND MONITORED THEIR DEGRADATION.

Q. WHAT ABOUT FROM YOUR EXPERIENCE OF ANALYZING SOIL SAMPLES, HAVE YOU BEEN ABLE TO DEVELOP ANY KNOWLEDGE IN THAT MANNER?

A. WILL YOU RESTATE THAT QUESTION FOR ME, SO I MAKE SURE I'M ANSWERING YOUR QUESTION?

Q. LET ME STATE IT A BETTER WAY.

DO YOU BELIEVE, FROM YOUR EXPERIENCE, THAT YOU CAN LOOK AT, SAY, A SOIL SAMPLE FROM A NON-AQUATIC SETTING AND DETERMINE THE SOURCE OF THAT PCB CONTAMINATION BASED UPON THE DISTRIBUTION?

A. I THINK THE ANSWER TO THAT QUESTION WOULD BE YES, AND I THINK THE ANSWER TO THAT QUESTION WOULD BE NO. I THINK THE SITUATION IS MORE COMPLICATED THAN THAT, AND IT WOULD REQUIRE A LOT MORE CLARIFICATION. UNDER CERTAIN CIRCUMSTANCES IF YOU'VE GOT SOMEBODY WHO'S PRODUCING A PARTICULAR MATERIAL AND NOBODY ELSE FOR THE NEXT SEVERAL HUNDRED MILES IS AROUND AND YOU FIND IT OUTSIDE THE BOUNDARIES OF THAT PLANT, I MEAN IT'S A PRETTY REASONABLE ASSUMPTION, ESPECIALLY IF IT'S COMPLETELY UNALTERED AND EXACTLY MATCHES TO THE BEST OF YOUR CAPABILITY WHAT THEY'RE DOING, THAT IT CAME FROM THERE.

PCB'S ARE A VERY DIFFERENT ANIMAL IN THE SENSE THAT

THERE ARE A VARIETY OF THINGS THAT COMPLICATE THAT SITUATION. THERE ARE TWO THAT I CAN THINK OF IMMEDIATELY. ONE IS, AS YOU POINTED OUT, THERE ARE A VARIETY OF BIOTRANSFORMATIONS AS WELL AS PHYSICAL CHEMICAL TRANSFORMATIONS THAT CAN OCCUR DEPENDING UPON HOW THAT PCB GOT FROM POINT "A" TO POINT "B," ESPECIALLY IF YOU'RE AT POINT "B." THE OTHER ISSUE IS, IS THAT, AS I STATED EARLIER, THE PRIMARY DISTRIBUTION OF PCB'S IN THE ENVIRONMENT OCCURRED AS A RESULT OF THE USE OF THE MATERIAL IN PRODUCTS -- OTHER PRODUCTS BY OTHER PEOPLE. AS SUCH THOSE MATERIALS HAVE BECOME TO BE CONSIDERED UBIQUITOUS. AND THE TERM "UBIQUITOUS" MEANS THAT IF YOU HAVE A SENSITIVE ENOUGH METHODOLOGY, YOU CAN FIND THEM PROBABLY EVERYWHERE IN THE ENVIRONMENT. SO DEPENDING UPON THE LEVEL, DEPENDING UPON THE ISOMER DISTRIBUTION, DEPENDING UPON THE FACTS OF WHERE YOU'RE AT AND WHAT'S GOING ON THERE, THE POSSIBILITY EXISTS TO ISOLATE IT TO THE POINT THAT YOU USED AS AN EXAMPLE. ON THE OTHER HAND, IF YOU PICK UP A SOIL SAMPLE AND FIND PCB'S IN IT, WHETHER THEY'RE ALTERED OR NOT ALTERED, THAT DOES NOT NECESSARILY MEAN THAT THE CLOSEST PCB PLANT PUT THOSE THERE OR THAT THE CLOSEST PCB USER PUT THOSE THERE. AS I SAID, PCB'S HAVE BEEN FOUND AND ESTABLISHED TO BE

FAIRLY UBIQUITOUS AT VERY LOW LEVELS. "UBIQUITOUS" MEANING DISTRIBUTED EVERYWHERE. SO I'D LOVE TO GIVE YOU A YES OR A NO ANSWER, BUT I HAVE TO GIVE YOU A YES AND A NO ANSWER AND I WOULD HAVE TO QUALIFY IT.

Q. HAVE YOU BEEN ASKED OR DO YOU PLAN ON DETERMINING OR LOOKING AT THE SOIL SAMPLES FROM THE PLAINTIFFS' PROPERTIES AND COMPARING THE ISOMER PATTERNS TO DETERMINE WHAT THE SOURCE OF THE PCB'S WAS?

BY MR. PRAUSE:

OBJECT TO THE FORM OF THE QUESTION.

WITNESS ANSWERS:

A. NO.

Q. DO YOU BELIEVE THAT THAT IS POSSIBLE?

A. I THINK THAT THAT QUESTION HAS BEEN ASKED, AND I THINK THAT I ANSWERED THAT QUESTION. AND IF WE WANT TO READ IT BACK, BECAUSE IT WAS A LENGTHY ANSWER BECAUSE IT'S A RATHER COMPLEX SITUATION, WE CAN, OR I CAN TRY TO DO IT AGAIN.

Q. THAT'S ALL RIGHT.

YOU MENTIONED PHYSICAL CHEMISTRY MAY ALSO AFFECT THE DISTRIBUTION OF PCB'S.

A. CORRECT.

Q. HAVE YOU DONE ANY STUDIES OR DO YOU HAVE ANY EXPERIENCE IN HOW PHYSICAL CHEMISTRY AFFECTS THE DISTRIBUTION OF ISOMERS IN A PCB?

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A. LET ME GIVE YOU AN EXAMPLE. EACH INDIVIDUAL PCB ISOMER HAS A DIFFERENT VAPOR PRESSURE. TOGETHER THEY INFLUENCE EACH OTHER'S VAPOR PRESSURE, BUT THEY STILL HAVE DIFFERENT VAPOR PRESSURES EVEN WHEN THEY'RE TOGETHER. SO IF A SAMPLE OF PCB WERE ON A GLASS SURFACE AND YOU LEFT IT THERE FOR A LONG TIME, ONE WOULD ANTICIPATE THAT THE MORE VOLATILE CONSTITUENTS AT ROOM TEMPERATURE WOULD, ON A MOLECULAR LEVEL, BEGIN TO DISSIPATE AND TRAVEL; WHEREAS, THE LESS VOLATILE ONES WOULD BE LESS LIKELY TO DO THAT. THAT'S A TYPE OF PHYSICAL CHEMICAL TRANSFORMATION THAT TAKES PLACE DURING THE ENVIRONMENTAL TRANSPORT OF THESE KINDS OF ORGANIC COMPOUNDS. AND IT'S NOT JUST PCB'S; IT'S HYDROCARBONS IN GENERAL, ANY OF THOSE KINDS OF THINGS. IT'S A FUNCTION OF THEIR VAPOR PRESSURE. THE OTHER KIND OF TRANSFORMATION THAT CAN OCCUR IS A FUNCTION OF THEIR AFFINITY FOR THE SURFACE THAT THEY HAPPEN TO BE ASSOCIATED WITH. IF YOU -- ONE OF THE SEPARATION TECHNIQUES THAT'S USED TO GET THE FINGERPRINT PATTERN THAT YOU GET FOR A GC, YOU RUN THE MATERIAL IN A GAS PHASE THROUGH A SOLID ADSORBENT OR THAT HAS LIQUID ON THE SURFACE, AND THEY PARTITION AT DIFFERENT RATES, WHICH GIVES YOU THE PATTERN THAT'S CHARACTERISTIC, DEPENDING UPON

THE SUPPORT OR THE SEPARATION MEDIA THAT YOU HAVE IN A COLUMN. THAT'S TRUE IN THE ENVIRONMENT TOO. WHEN PCB'S ARE PLACED ON A SURFACE THAT SOME LIKE BETTER THAN OTHERS, THE ONES THAT LIKE THAT SURFACE HAVE A TENDENCY TO STAY THERE VERSUS THE ONES WHO DON'T LIKE THAT SURFACE SO WELL WHICH CAN MOVE. SO IF YOU'RE AT THE POINT WHERE YOU'RE LOOKING AT PCB'S THAT HAVE BEEN MOVED FROM A PHYSICAL CHEMICAL PROCESS, THEY WILL LOOK MUCH DIFFERENT THAN THOSE PCB'S THAT HAVE NOT BEEN MOVED BY A PHYSICAL CHEMICAL PROCESS. SO THERE'S A KIND OF SEPARATION THAT OCCURS THAT'S BASED ON THE PHYSICAL PROPERTIES OF THE MOLECULES IN QUESTION. EACH ISOMER HAS DIFFERENT PHYSICAL PROPERTIES.

ALSO SUPPOSE SUNLIGHT WERE TO SHOW ON THESE MOLECULES AT A CONCENTRATION THAT WAS LOW ENOUGH WHERE WHEN THEY WENT AWAY YOU COULD SEE A SIGNIFICANT CHANGE. SOME OF THOSE ISOMERS WOULD PHOTO-DECOMPOSE FASTER THAN OTHERS, AND SO THE PATTERN THAT YOU WOULD SEE WOULD BE ALTERED BASED ON THE PHOTO DECOMPOSITION AND THAT KIND OF THING.

SO THERE ARE LOTS OF PHYSICAL CHEMICAL WAYS THAT PCB ISOMER DISTRIBUTION CAN BE TRANSFORMED, AND THERE ARE LOTS OF BIOCHEMICAL WAYS IT CAN BE TRANSFERRED AND BIOTRANSFORMATION WAYS. THAT'S WHAT I'M TRYING

TO GET AT.

Q. NOW, WITHIN YOUR CLASSIFICATION OF ISOMERS DO ALL THE MONO ISOMERS HAVE THE VAPOR PRESSURES, FOR INSTANCE?

A. NO, I DON'T THINK THEY DO. DO THEY HAVE VERY SIGNIFICANTLY DIFFERENT VAPOR PRESSURES? IT DEPENDS ON WHAT YOU'D CALL SIGNIFICANT, BUT THEY'RE PROBABLY FAIRLY CLOSE. AS A GROUP THEY'RE CERTAINLY DIFFERENT THAN THE DICHLORS, PROBABLY.

Q. BUT WITHIN THAT GROUP YOU HAVE VARYING DEGREES OF VAPOR PRESSURES?

A. CORRECT. LET ME -- FOR EXAMPLE, 4,4-PRIME-BIPHENYL -- DICHLOROBIPHENYL BY ITSELF IS A HIGHLY CRYSTALLINE MATERIAL BECAUSE IT STRUCTURES LIKE THAT. AND IF YOU HAVE A LITTLE BIT TOO MUCH 4,4-PRIME-DICHLOROBIPHENYL IN THE PCB MIXTURES, IT'S NOT A LIQUID. IT CRYSTALLIZES OUT. BUT THAT'S THE ONLY ISOMER THAT DOES THAT KIND OF THING, TRUTHFULLY. SO THE PRODUCT AROCLOR 1232 IS MANUFACTURED BY COMBINING 50 PERCENT 1221 AND 50 PERCENT 1242. AND THE REASON FOR THAT IS, IS THAT IF YOU TRY TO MAKE IT DIRECTLY, YOU CREATE A DISPROPORTIONATE AMOUNT OF THE 4,4-PRIME-BICHLORAL AND IT PRECIPITATES OUT AND IS CRYSTALLINE, AND THE MATERIAL IS NO LONGER A FUNCTIONAL FLUID.

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SO THAT'S WHAT I'M TRYING TO SAY. EACH OF THE INDIVIDUAL ISOMERS HAVE DIFFERENT PROPERTIES. SOME ARE MAJOR DIFFERENT AND SOME ARE NOT, SO YOU NEED TO KNOW SPECIFICALLY WHAT YOU'RE TALKING ABOUT.

Q. WE TALKED A LITTLE BIT ABOUT THE SAMPLES -- THE ENVIRONMENTAL SAMPLES THAT YOU TOOK AS FAR AS SOIL SAMPLES. ARE YOU AWARE OF MONSANTO TAKING ANY BLOOD SAMPLES FROM WORKERS AT ANNISTON?

A. NOT AT ANNISTON, NO.

Q. WHERE ARE YOU AWARE OF THEM TAKING BLOOD SAMPLES?

BY MR. PRAUSE:

ARE YOU TALKING ABOUT ANY BLOOD SAMPLE OR FOR PCB ANALYTICAL PURPOSES?

DIRECT EXAMINATION RESUMED BY MR. FELL:

Q. WELL, LET'S SAY HUMAN PCB SERUM LEVELS.

A. I RECALL, WAY BACK WHEN, THAT WE HAD A FEW SAMPLES THAT WERE SUBMITTED TO US, BUT I HONESTLY DON'T KNOW THE SOURCE OF IT. AND THAT'S NOT UNCOMMON WITH SAMPLES.

Q. DO YOU REMEMBER MONSANTO TESTING THEIR OWN EMPLOYEES ANYWHERE?

A. DO I REMEMBER?

Q. YES.

A. DO I -- WHAT DO YOU MEAN BY "REMEMBER"? I KNOW THEY TESTED EMPLOYEES FOR PCB'S. YOU KNOW, I KNOW OTHER

COMPANIES HAVE TOO. I'VE BEEN TESTED MYSELF, SO. . .

Q. WHAT WAS YOUR PCB LEVEL?

A. I DON'T REMEMBER. IT WAS PROBABLY PRETTY AVERAGE, MAYBE A LITTLE HIGHER BECAUSE I HAPPEN TO HAVE WORKED AROUND THEM A FAIR AMOUNT. PROBABLY BACK TO AVERAGE AGAIN NOW BECAUSE I HAVEN'T HAD ANYTHING TO DO WITH THEM FOR A LONG TIME.

Q. DO YOU REMEMBER WHERE THOSE EMPLOYEES WERE LOCATED?

A. DO -- FIRST OF ALL, I DON'T REMEMBER ANY EMPLOYEES. I REMEMBER ANALYZING BLOOD SAMPLES TO DETERMINE WHETHER OR NOT THE METHODOLOGY WOULD WORK ON BLOOD SAMPLES. WHETHER OR NOT THOSE WERE MONSANTO EMPLOYEES OR WHERE THEY CAME FROM I DON'T KNOW. I WAS PROVIDED BLOOD SAMPLES -- UNSPECIFIED BLOOD SAMPLES TO DETERMINE WHETHER OR NOT WE COULD USE OUR METHODOLOGY TO MEASURE PCB'S IN BLOOD.

Q. AND WERE YOU ABLE TO DETERMINE WHETHER YOU COULD USE YOUR METHODOLOGY?

A. YES. THE METHODOLOGY WORKED.

Q. WHAT ABOUT AIR SAMPLES, WHEN DID YOU FIRST ANALYZE -- OR DID YOU ANALYZE AIR SAMPLES WHEN YOU WERE AT MONSANTO?

A. YES. THERE WERE -- THE INITIAL AIR SAMPLES THAT I MEASURED WERE OF PAPER THAT HAD AROCLOR 1242 ON IT,

WHERE WE TOOK THE PAPER AND LIT IT ON FIRE AND THEN COLLECTED THE VAPORS OVER IT TO SEE IF PCB'S WERE TRANSPORTED FROM THE PAPER. THAT WAS THE FIRST THING THAT COULD EVEN BE MISCONSTRUED AS AN AIR SAMPLE THAT I MIGHT HAVE MEASURED PCB'S IN. THE FOCUS AT MONSANTO WAS MORE TOWARD THOSE MATRICES THAT SHOWED HIGH LEVELS OF PCB, AND I DID NOT DO A LOT OF AIR TRANSPORT WORK. HOWEVER, AFTER LEAVING MONSANTO THE LABORATORIES THAT I WAS ASSOCIATED WITH VERY FREQUENTLY DID ANALYZE SAMPLES FOR PCB'S.

Q. SO ARE YOU AWARE OF ANY AIR SAMPLES FROM THE ANNISTON PLANT FOR PCB'S?

A. NOT OF SPECIFIC SAMPLES. I'M AWARE THAT THERE WERE PROBABLY AIR SAMPLES THAT WERE TAKEN AT THE ANNISTON PLANT OVER THE YEARS, BUT I'M NOT AWARE OF ANY SPECIFIC SAMPLES, AND I DON'T RECALL ANALYZING ANY SPECIFIC AIR SAMPLES FROM THE ANNISTON PLANT.

Q. SO YOU WOULDN'T RECALL WHAT METHODOLOGY THEY WOULD'VE USED TO SAMPLE THE AIR IN, SAY, 1970?

A. PROBABLY NOT. I WOULD RECALL HOW THEY WOULD ANALYZE THE SAMPLE, THOUGH. I MEAN, THEY WOULD USE THE TECHNIQUES WE DEVELOPED.

Q. BUT HOW WOULD YOU WORK WITH THAT IN AIR?

A. IN GENERAL, WHAT'S DONE TODAY AND WHAT'S BEEN DONE IN THE PAST, THERE ARE STANDARD METHODOLOGIES WHERE

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YOU USE ADSORPTION TUBES. AND GENERALLY YOU DRAW AIR THROUGH A SILICA TUBE, AND THEN YOU TAKE THE SILICA TUBE AND YOU EXTRACT THE PCB'S FROM IT, OR WHATEVER IS ADSORBED FROM THE AIR FROM IT, AND THEN YOU ANALYZE IT. ALSO THEY USE POLYURETHANE FOAM, WHICH IS ANOTHER GOOD COLLECTION DEVICE FOR PCB'S IN AIR SAMPLES. AND, YOU KNOW, I'VE ANALYZED A LOT OF POLYURETHANE FOAM SAMPLES OVER THE YEARS, AND I'VE DONE A LOT OF -- THE LABORATORIES THAT I'VE RUN AND THAT I'VE MANAGED AND THE GROUPS THAT I'VE RUN AND MANAGED HAVE ANALYZED AIR SAMPLES FOR PCB'S.

Q. WOULD THEY HAVE USED THE SILICA TUBES AND THE POLYURETHANE FOAM BACK IN 1970 ALSO?

A. PROBABLY NOT. THAT WAS A LITTLE EARLY FOR THE POLYURETHANE FOAM. THEY MIGHT HAVE USED THE SILICA. MORE LIKELY THEY MIGHT HAVE USED PARTICULATE FILTERS OR SOMETHING OF THAT SORT. BUT I'M NOT AWARE OF THE SAMPLING TECHNOLOGY THAT WAS USED, AND I DON'T RECALL ANALYZING ANY AIR SAMPLES OF THAT SORT IN MY LABORATORY AT MONSANTO.

Q. WHERE ELSE WOULD THEY HAVE DONE THAT TYPE OF WORK?

A. IN 1970?

Q. YES.

A. VERY FEW PLACES.

Q. LET ME SHOW YOU A DOCUMENT WHICH FOR PURPOSES OF

IDENTIFICATION WE'LL MARK AS PLAINTIFFS' EXHIBIT NUMBER 3.

(COURT REPORTER MARKS DOCUMENT AS PLAINTIFFS' EXHIBIT NUMBER 3, TO BE RETAINED BY COUNSEL)

DIRECT EXAMINATION RESUMED BY MR. FELL:

Q. I'LL ASK YOU IF YOU RECOGNIZE THAT.

BY MR. PRAUSE:

DO YOU HAVE ANY OTHER COPIES?

BY MR. FELL:

UNFORTUNATELY THAT'S THE ONLY ONE I BROUGHT.

(PAUSE - WITNESS REVIEWS DOCUMENT)

WITNESS ANSWERS:

A. I'VE NOT SEEN THIS DOCUMENT BEFORE. I DON'T SEE MYSELF ON ANY OF THE DISTRIBUTION, AND THE DOCUMENT WAS GENERATED DECEMBER -- THE NEXT TO THE LAST DAY IN 1970 -- DECEMBER 29, 1970.

Q. AND YOU WERE EMPLOYED AT MONSANTO THROUGH -- WHAT? -- '75?

A. ACTUALLY THROUGH, I THINK, '78.

Q. '78. BUT YOU'VE NEVER SEEN THESE SAMPLE RESULTS BEFORE?

A. NO, SIR.

Q. DO YOU RECOGNIZE ANY OF THE NAMES ON THE CC LIST?

A. YOU'RE TALKING ABOUT -- SPECIFICALLY ABOUT THE CC LIST?

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Q. YES.
A. I RECOGNIZE HODGES AS A NAME I'VE SEEN BEFORE. I RECOGNIZE LANDWEHR. CORDER AND BELL, IF YOU'LL PARDON THE EXPRESSION, DON'T -- I'M NOT GOING TO SAY IT. I WAS GOING TO SAY "DON'T RING A BELL WITH ME." BUT I DON'T RECALL THOSE PEOPLE SPECIFICALLY, AND JESSEE I DON'T RECALL.
Q. YOU DO, OBVIOUSLY, RECALL PAPAGEORGE, THOUGH, RIGHT?
A. OH, YES, SIR. I KNOW BILL PAPAGEORGE VERY WELL.
BY MR. PRAUSE:
COULD I LOOK AT THAT DOCUMENT?
BY MR. FELL:
SURE.
BY MR. PRAUSE:
THANKS.
DIRECT EXAMINATION RESUMED BY MR. FELL:
Q. YOU OBVIOUSLY WEREN'T THEN INVOLVED IN THE DEVELOPMENT OF THE TECHNIQUES THAT MONSANTO USED FOR THOSE SAMPLES; IS THAT CORRECT?
A. YOU'RE TALKING ABOUT THE SAMPLING TECHNIQUES?
Q. WELL, FOR THE AIR.
A. THE SAMPLING TECHNIQUES FOR THE AIR?
Q. YES.
A. IF YOU'RE TALKING ABOUT THE ANALYSIS OF THE MATERIAL THAT THEY SCRUBBED THE PCB'S OUT OF THE AIR WITH,

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WHICH IS WHAT THEY'RE SAYING THEY DID HERE, WE ESTABLISHED THE ANALYSIS TECHNIQUES THAT WERE USED IN ANNISTON AND TAUGHT THEM HOW TO DO IT AND TOLD THEM WHAT EQUIPMENT TO BUY AND MADE SURE THEY WERE DOING IT RIGHT. WE DID NOT RECOMMEND AND/OR PARTICIPATE IN THE AIR SAMPLING OR TELL THEM HOW TO DO IT, TO MY KNOWLEDGE. I DON'T RECALL DOING THAT AND I'M PRETTY SURE I DID NOT.

Q. AND YOU DON'T REMEMBER ANALYZING THOSE SAMPLES?

A. NO. UH-UH (NEGATIVE). I DON'T. AND I -- BY THIS TIME, AS I SAID, WE HAD TRAINED THEM ALREADY TO DO THAT KIND OF THING, SO THEY DID WHAT THEY WERE TOLD TO DO AND WHAT THEY FELT THEY NEEDED TO DO. AND AT THAT POINT IN TIME I WASN'T THE ONLY ANALYTICAL CHEMIST IN THE WORLD THAT COULD DO IT ANYMORE.

Q. ARE YOU AWARE OF A 1930 STUDY FROM, I BELIEVE, SOMEWHERE IN EUROPE WHERE THEY BURIED SOME PCB'S AND DUG THEM UP SOME YEARS LATER AND STILL FOUND THEM THERE?

A. NO.

Q. WHEN DID YOU ULTIMATELY CONCLUDE FROM YOUR WORK AT MONSANTO THAT PCB'S WERE PERSISTENT IN THE ENVIRONMENT?

A. I THINK WE -- WHEN WE BEGAN TO UNDERSTAND HOW THINGS WERE MOVING AROUND AND WHEN WE BEGAN TO ANALYZE A

LOT OF DIFFERENT SAMPLES AND WHEN CHEMISTS ALL OVER THE WORLD -- GOVERNMENT, UNIVERSITY, OTHER COMPANY CHEMISTS -- BEGAN TO FIND THE SAME KIND OF THING AND AT VERY LOW LEVELS AND WHEN IT BECAME KNOWLEDGEABLE THAT PCB'S WERE PRETTY MUCH UBIQUITOUS. AFTER WE'D DONE BIODEGRADATION STUDIES AND THAT KIND OF STUFF WE BEGAN TO REALIZE THAT THE HALF-LIVES OF SOME OF THE PCB'S IN THE ENVIRONMENT WERE PRETTY LONG. IF THAT'S WHAT YOU MEAN BY "PERSISTENT," AND THAT'S WHAT I MEAN BY "PERSISTENT." THE SAME KIND OF CHARACTERISTIC, FOR EXAMPLE, THAT DDT HAS. I WOULD GUESS PROBABLY JUST PRIOR TO OR AT ABOUT WHEN MONSANTO VOLUNTARILY QUIT MANUFACTURING PCB'S AND WHEN TSCA BECAME A REALITY. I THINK THAT'S ONE OF THE THINGS THAT CAUSED TSCA TO BECOME A REALITY.

Q. DO YOU KNOW WHAT YEAR THAT WAS?

A. YEAH. I THINK -- WELL, I THINK WE QUIT MANUFACTURING PCB'S IN ANNISTON IN 1971. I THINK WE PROBABLY SHIPPED THE LAST PCB'S OF ANY KIND WHATSOEVER IN PROBABLY '77, AND I THINK '77 WAS THE YEAR THAT PCB'S WERE BANNED -- THE MANUFACTURE OF PCB'S WAS BANNED BY THE ENVIRONMENTAL PROTECTION AGENCY.

Q. NOW, WHEN YOU ALL STOPPED PRODUCTION OF PCB'S, YOU HAD A REPLACEMENT FLUID FOR MOST OF THE

APPLICATIONS; IS THAT CORRECT?

A. WE AND OUR CUSTOMERS HAD DEVELOPED -- AND OUR COMPETITION HAD DEVELOPED REPLACEMENT FLUIDS -- OR I SHOULD SAY REPLACEMENT STRATEGIES.

Q. HOW DOES THE VAPOR PRESSURE OF BIPHENYL RELATE TO THE VAPOR PRESSURE OF PCB'S IN GENERAL?

A. TO THE EXTENT THAT IT'S PRESENT IN THE PCB PRODUCT THAT YOU'RE TALKING ABOUT?

Q. NO. I JUST MEANT IN GENERAL. IF YOU SET BIPHENYLS HERE AND ---

A. IT'S PROBABLY -- IT PROBABLY -- UNLESS THERE'S SOME STRANGE SYNERGY BETWEEN CHLORINE SUBSTITUTION ON THE RING IT'S PROBABLY THE MOST VOLATILE AND LOWEST BOILING OF ALL THE PCB'S, IF YOU CONSIDER BIPHENYL A PCB.

Q. RIGHT. WITHOUT THE CHLORINE ---

A. THAT'S CORRECT.

Q. JUST THE PURE BIPHENYL IS THE MOST VOLATILE?

A. (INDICATES AFFIRMATIVE RESPONSE)

Q. OKAY. ARE YOU GOING TO DO OR HAVE YOU DONE AN EVALUATION OF WHAT SOURCES ARE IN THE ANNISTON AREA OF PCB'S?

A. THOSE ARE TWO QUESTIONS. WHICH ONE DO YOU WANT ME TO ANSWER FIRST?

Q. LET'S ASK ABOUT YOU. HAVE YOU DONE ANY

INVESTIGATIONS TO DETERMINE WHAT THE SOURCES OF PCB ARE IN THE ANNISTON -- AROUND THE ANNISTON PLANT?

A. NO.

Q. ARE YOU AWARE OF ANY STUDIES THAT HAVE BEEN PERFORMED?

A. NOT AT THIS POINT.

Q. ARE YOU PLANNING TO DO ANY STUDIES IN THAT REGARD?

A. I CURRENTLY AM NOT.

Q. ARE YOU AWARE OF ANY OTHER PCB SOURCES IN THE ANNISTON AREA?

A. YES.

Q. AND WHAT ARE THOSE POSSIBLE SOURCES?

A. WELL, I BELIEVE THERE WAS A CAPACITOR OR TRANSFORMER PLANT THAT WASN'T TOO FAR AWAY, AND I BELIEVE THAT THERE WERE PROBABLY A LOT OF HYDRAULIC SHOPS IN THE AREA THAT USED HYDRAULIC FLUIDS. I BELIEVE THERE ARE A LOT OF SOURCES OF PCB'S IN THE AREA. WE'VE ALREADY ESTABLISHED THAT SOME PCB'S ARE PRETTY MUCH UBIQUITOUS DUE TO THE ENVIRONMENTAL TRANSPORT PROPERTIES OF THESE TYPES OF COMPOUNDS AND THE LONGEVITY, OR PERSISTENCE AS YOU SAID EARLIER. SO, YOU KNOW, THE PCB'S IN THE AREA -- I'M SURE THERE ARE A LOT OF SOURCES OF IT, THE END USERS OF THOSE PCB'S, AND I'M SURE A LOT OF THE PCB'S IN THE AREA ARE TRANSPORTED BY PARTICULATES COMING, THINGS OF

THAT SORT, SO. . .

DOES THAT ANSWER YOUR QUESTION?

Q. WHAT WOULD YOU CONSIDER TO BE THE MAJOR SOURCE OF PCB'S AROUND THAT PLANT?

A. YOU'D HAVE TO DEFINE "AROUND THAT PLANT."

Q. LET'S SAY WITHIN A MILE RADIUS OF THE PLANT.

A. I'D HAVE TO KNOW WHAT'S WITHIN A MILE RADIUS OF THE PLANT BESIDES THE PLANT.

Q. HOW DO PCB'S ACT IN THE AIR?

A. CAN YOU FURTHER DEFINE WHAT YOU MEAN BY "ACT," PLEASE?

Q. WELL, HOW ARE PCB'S TRANSPORTED IN THE AIR?

A. WELL, THERE ARE TWO PRIMARY PATHWAYS THAT AIR TRANSPORT OF ANY CHEMICAL CAN OCCUR NO MATTER WHAT ITS PROPERTIES ARE, AND ONE IS PARTICULATE. IT CAN BE IN, ON, OR ADSORBED BY PARTICULATE OR DUST THAT'S MOVED ABOUT THROUGH THE ATMOSPHERE BY AIR MOVEMENTS, OR IT CAN BE AS A VAPOR. FOR PCB'S, BECAUSE OF THE VAPOR PRESSURE, THE LOW -- HIGH VAPOR PRESSURE ASSOCIATED WITH THOSE THE PRIMARY TRANSFER MECHANISM WOULD PROBABLY BE THROUGH ADSORPTION ON PARTICULATES AND THEN MOVEMENT OF THE PARTICULATES.

Q. WOULD YOU AGREE WITH ME AS OF 1969 THAT MONSANTO KNEW OR SHOULD HAVE KNOWN THAT THE AREA CLOSELY SURROUNDING THE PLANT WAS CONTAMINATED WITH PCB'S?

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BY MR. PRAUSE:

I'LL OBJECT TO THE FORM OF THE QUESTION. IT'S REALLY TWO QUESTIONS.

WITNESS ANSWERS:

A. THE DIFFICULTY I'M HAVING IN ANSWERING YOUR QUESTION IS YOU USE THE WORD "CONTAMINATION" AND I NEED TO KNOW WHAT THAT MEANS. IF YOU'RE ASKING ME IF I ASKED SOMEBODY DOWN THERE IN ENGINEERING WHO IS KNOWLEDGEABLE WHETHER OR NOT VERY MINOR, INSIGNIFICANT LEVELS OF PCB'S MIGHT BE GETTING OFF -- - YOU KNOW, OUTSIDE THE PLANT ON THE PROPERTY, THEY COULD PROBABLY -- THEY MIGHT BE ABLE TO AGREE WITH THAT, BUT THEY WOULDN'T KNOW. THERE WAS NO INFORMATION THAT WOULD ALLOW ANYBODY TO DRAW THOSE KINDS OF CONCLUSIONS, AND CERTAINLY THERE HAD BEEN NO SAMPLING WHERE THERE WERE DEFINITIVE INFORMATION THAT WOULD ALLOW THEM TO SAY YES TO THAT QUESTION. I THINK YOU NEED TO REALLY UNDERSTAND THE TIME FRAME THAT YOU'RE DEALING WITH. I BELIEVE YOU SAID 1969 OR ---

Q. YES.

A. OKAY. IN 1969, YOU KNOW, PART PER BILLION WAS AN UNKNOWN ENTITY. I MEAN, JUST NOT MANY PEOPLE EVEN UNDERSTOOD WHAT A PART PER BILLION IS OR EVEN HAD HEARD THE TERM. PART PER MILLION WAS A LITTLE BIT

BETTER, BUT CERTAINLY EVEN THAT WASN'T KNOWN. NOW, IF YOU WANTED TO TALK ABOUT A TENTH OF A PERCENT OR A HUNDREDTH OF A PERCENT OR THOUSANDTH OF A PERCENT, PEOPLE COULD PROBABLY COMPREHEND THAT KIND OF THING AND MIGHT CONSIDER, YOU KNOW, A TENTH OF A PERCENT MEASURABLE BUT NOT SIGNIFICANT.

IF THEY WERE MANUFACTURING PCB'S THERE AND THEY WERE DELIVERING 99.9 PERCENT OF THAT MATERIAL TO THE CUSTOMER, THAT WOULD'VE BEEN OUT OF SIGHT AND GREAT. I MEAN, THAT WAS FINE. ONLY A TENTH OF A PERCENT OF THE MATERIAL NOT ACCOUNTED FOR? THAT WOULD'VE BEEN FANTASTIC. SO THAT WAS THE KNOWLEDGE BASE AND THE KNOWLEDGE LEVEL AT THAT POINT IN TIME.

IF YOU HAD A REASON TO ASK THAT KIND OF QUESTION OF THOSE PEOPLE, IN RETROSPECT, THEY MIGHT BE ABLE TO DRAW THE CONCLUSION AND SAY, "YEAH, THERE MIGHT BE SOME PCB'S AT THE PERIMETER OF THAT PLANT." BUT FOR THEM TO TELL YOU DEFINITELY, THEY MIGHT THINK THEY COULD BUT, BELIEVE ME, THEY COULDN'T.

Q. WELL, IN 1969, ISN'T THAT WHEN YOU RAN YOUR SAMPLES AND FOUND PCB'S ---

A. CORRECT.

Q. --- OUTSIDE THE PLANT PROPERTY?

A. CORRECT. WHEN IN 1969?

Q. BY THE END OF 1969.

A. YES.

Q. BY THE END OF 1969 MONSANTO KNEW THAT PCB'S WERE OFF-SITE IN BASICALLY THE PART-PER-MILLION LEVEL; IS THAT CORRECT?

A. CORRECT. WHEN WE RAN THE FIRST SAMPLES FROM THE DRAINAGE DITCH THAT EVENTUALLY WENT INTO SNOW CREEK, TO THE BEST OF MY RECOLLECTION THOSE ARE THE VERY FIRST SAMPLES THAT WE HAD THE TECHNOLOGY AVAILABLE TO US THAT COULD DEFINITIVELY SHOW, IF THE PATTERN WASN'T TOO ALTERED, THAT PCB'S WERE PRESENT. AND, YES, WE FOUND PCB'S IN THOSE SAMPLES. NOW, COULD THE AVERAGE ENGINEER IN THE PLANT THAT WASN'T INVOLVED WITH OUR PROJECT UNDERSTAND THAT AT THAT POINT IN TIME IF HE WERE ASKED THAT QUESTION UNLESS HE WAS APPRAISED (SIC) OF THAT KNOWLEDGE? AND MY ANSWER STILL STANDS THAT I MENTIONED EARLIER: THAT UNTIL WE ACTUALLY HAD DEFINITIVE TECHNIQUES THAT ALLOWED US TO SAY AT A 99-PERCENT LEVEL THAT THERE WERE PROBABLY PCB'S THERE AND THIS WAS HOW MUCH WAS THERE, NOBODY COULD DO ANYTHING ELSE BESIDES HAVE CONJECTURE. THEY COULD SPECULATE THAT THEY MIGHT BE THERE, BUT THEY COULDN'T ACTUALLY SAY THEY WERE THERE. THAT'S WHY WE DID IT.

Q. BUT MY QUESTION WAS AS OF -- BY THE END OF 1969 MONSANTO KNEW THAT PCB'S WERE OFF-SITE IN PART-PER-

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MILLION LEVELS?

A. WHEN WE MEASURED THOSE SAMPLES, CORRECT. OKAY?

Q. OKAY.

A. WHEN I TALKED ABOUT '69, I WAS TALKING ABOUT '69 PRIOR TO WHEN WE MADE THE FIRST -- VERY FIRST MEASUREMENTS.

Q. AND AS OF THE END OF 1969 -- LET'S JUST SAY 1970, MONSANTO HAD THE ABILITY TO TEST PEOPLE'S PROPERTY SURROUNDING THE PLANT TO DETERMINE IF PCB'S WERE ON THEIR PROPERTY; IS THAT CORRECT?

A. NO. I DON'T BELIEVE THAT. WE HAD THE ABILITY TO TEST A LIMITED NUMBER OF SAMPLES AT THE CENTRAL LABORATORY IN ST. LOUIS. AS YOU'VE ALREADY POINTED OUT TO ME, THE SAMPLES THAT WE TESTED WERE TAKEN MONTHS BEFORE WE COULD EVEN GET TO THEM. SO WE HAD LIMITED CAPABILITIES TO DO THAT KIND OF TESTING, AND AS QUICKLY AS WE POSSIBLY COULD -- AND I THINK THE RECORD REFLECTS THAT -- WE BEGAN, ONCE WE HAD ESTABLISHED THOSE TECHNIQUES, TO EXPAND THEM AND ESTABLISHED A FACILITY FOR MEASURING PCB'S, VERY QUICKLY ON THE TIME SCALE THAT WE HAD TO DO IT BACK THEN, AT THE ANNISTON PLANT. AT THAT POINT IN TIME THEN A PRIORITY COULD BE DETERMINED TO DETERMINE, YOU KNOW, WHERE IT WAS GOING AND THINGS OF THAT SORT, AND AT THAT POINT IN TIME THEY WERE ON THEIR

OWN TO CHOOSE WHAT THEY DID.

Q. WHAT YEAR WAS IT WE SAID THAT THE PLANT HAD ITS OWN GC UP AND RUNNING?

BY MR. PRAUSE:

THE ANNISTON PLANT?

BY MR. FELL:

THE ANNISTON PLANT.

WITNESS ANSWERS:

A. I'M NOT SURE WE DID SAY THAT, BUT I DO KNOW THAT THERE ARE DOCUMENTS IN THE RECORD THAT SAY EXACTLY WHEN. SO IF YOU WANT AN EXACT DATE, I'M SURE YOU COULD LOOK IN THE RECORD AND SEE. I BELIEVE MARCH, JUNE, SOMETHING LIKE THAT. I DON'T -- I CAN'T REMEMBER EXACTLY. '69, '70. '70, PROBABLY.

Q. CERTAINLY BY 1975 MONSANTO HAD THE ABILITY TO TEST -- --

A. ABSOLUTELY.

Q. --- ALL THE NEIGHBORHOODS TO SEE WHERE THE PCB'S WERE?

A. MONSANTO AND OTHER LABORATORIES, INCLUDING THE EPA LABORATORIES AND THE STATE LABORATORIES. A LOT OF PEOPLE HAD THE CAPABILITY BY 1975 TO BEGIN DOING THOSE KINDS OF MEASUREMENTS.

Q. DO YOU HAVE ANY IDEA OF HOW MUCH PCB WAS RELEASED AT THE ANNISTON PLANT?

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A. NO.
Q. SO YOU COULDN'T SAY THAT OTHER SOURCES IN THE ANNISTON AREA WERE A SIGNIFICANT OR NOT SIGNIFICANT CONTRIBUTOR TO THE PCB CONTAMINATION IN THE AREA?
A. THAT'S THE FIRST TIME I'VE BEEN ASKED THAT QUESTION, AND, NO, I COULDN'T. I WAS ASKED PREVIOUSLY IF THERE COULD BE OTHER SOURCES OF PCB'S, AND THERE PROBABLY ARE. I'M SURE THAT INFORMATION IS AVAILABLE.
Q. IF WE CAN, LET'S GO AHEAD AND GO THROUGH YOUR REPORT AND SEE IF THERE'S ANYTHING WE HAVEN'T TALKED ABOUT IN THERE.
FIRST OF ALL, IN PARAGRAPH ONE, YOU WERE RETAINED BY MONSANTO. WHEN WERE YOU RETAINED?
A. IT SAYS THE ABERNATHY VERSUS MONSANTO COMPANY?
Q. YES.
A. I GUESS IT WAS PROBABLY WHENEVER I RECEIVED THOSE DOCUMENTS. I THINK THERE'S ONE PACKET THAT DEALS SPECIFICALLY WITH ABERNATHY, 168 PARCELS OR SOMETHING OF THAT SORT.
Q. THE BONNER ANALYTICAL DATA?
A. YES.
Q. WHICH THE COVER LETTER THAT WE SENT ---
A. WHEN I RECEIVED THAT.
Q. WE SENT THEM TO THE DEFENDANTS ON DECEMBER FIRST,

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1998.

A. DECEMBER FIRST, 1998. I PROBABLY DIDN'T GET THAT UNTIL SHORTLY BEFORE -- I THINK I RECALL RECEIVING THAT SHORTLY BEFORE I WENT DOWN TO BIRMINGHAM ON THE TWENTY-EIGHTH, TWENTY-NINTH OF DECEMBER.

Q. SO YOU WERE RETAINED IN BASICALLY DECEMBER OF 1998; IS THAT YOUR BEST RECOLLECTION? FOR THIS CASE.

A. YES.

Q. WHEN WERE YOU RETAINED IN THE DYER CASE?

A. I BELIEVE IN THE DYER CASE IT WAS AROUND OCTOBER EIGHTEENTH OR SO THAT I RECEIVED THAT INFORMATION.

Q. PRIOR TO THAT DID YOU HAVE ANY KNOWLEDGE THAT LITIGATION WAS PROCEEDING AGAINST MONSANTO IN ANNISTON, ALABAMA?

A. YES.

Q. AND WHEN DID YOU BECOME AWARE OF THAT?

A. WELL, THERE WAS A CASE -- MORRIS HILL OR SOMETHING OF THAT SORT -- THAT I HAD BEEN SENT SOME INFORMATION ON, BUT IT'S MY UNDERSTANDING THAT THAT'S BEEN SUBSEQUENTLY SETTLED. AND I BELIEVE THAT'S ALSO IN THAT INFORMATION PACKET THAT YOU ASKED ME TO BRING OF ALL THE INFORMATION I HAD REGARDING THESE CASES.

Q. I BELIEVE WE TALKED ABOUT YOUR EDUCATION. YOU STATED YOU ADAPTED AND DEVELOPED ANALYTICAL

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TECHNIQUES FOR MONITORING CHEMICALS, INCLUDING POLYCHLORINATED BIPHENYLS, IN VARIOUS MATRICES, INCLUDING ENVIRONMENTAL SAMPLES. HAVE WE TALKED ABOUT EVERYTHING THAT YOU WOULD DERIVE FROM THAT SENTENCE?

A. YES.

Q. THESE TECHNIQUES INCLUDE GAS CHROMATOGRAPHY AND ELECTRON CAPTURE, FLAME IONIZATION, THERMAL CONDUCTIVITY, FLAME PHOTOMETRIC, NITROGEN-PHOSPHATE. I REALIZE WE HAVEN'T TALKED ABOUT SOME OF THOSE, BUT HAVE WE TALKED ABOUT THE PCB ANALYSIS THAT YOU DEVELOPED AND THE TECHNIQUES USED?

A. CORRECT. SOME OF THESE THAT YOU HAVEN'T MENTIONED -- MASS SPECTROMETRY, ELECTRO-CONDUCTIVITY, MICROCOULOMETRIC, PHOTOIONIZATION, ALL OF THOSE WERE -- ESPECIALLY ELECTRO-CONDUCTIVITY AND MASS SPECTROMETRY, AND MICROCOULOMETRY -- WERE TECHNIQUES THAT ARE APPLICABLE TO CHLORINATED HYDROCARBONS AND WERE LOOKED AT. THE TECHNIQUE OF CHOICE TURNED OUT TO BE EC -- ELECTRON CAPTURE FOR SCREENING PURPOSES AND MASS SPEC FOR ABSOLUTE IDENTIFICATION.

Q. AND THEN YOU DESIGNED AND IMPLEMENTED AVIAN, MAMMAL, AQUATIC TOXICOLOGICAL STUDY PROTOCOLS FOR TISSUE RESIDUE, BACTERIAL DEGRADATION, AND BIOACCUMULATION STUDIES. HAVE WE TALKED ABOUT ALL OF THAT?

A. YES.

Q. AND, AGAIN, YOUR MAIN DEALING IN MOST OF THAT WAS THE ANALYTICAL PART OF THE PROCESS; IS THAT CORRECT?

A. IT WAS IN THE ANALYTICAL PART OF THE PROCESS AND THE ANALYTICAL -- AND WHAT THE ANALYTICAL INFORMATION HAD TO SAY ABOUT THE ISOMER DISTRIBUTION AS IT WAS CHANGED THROUGH THE VARIOUS SYSTEMS.

Q. IN PARAGRAPH FOUR YOU STATE THAT YOU'VE PUBLISHED NUMEROUS PEER-REVIEWED PAPERS. ARE THOSE THE PAPERS THAT ARE LISTED IN YOUR CV?

A. THOSE ARE THE PAPERS THAT ARE LISTED IN THE CV, YES.

Q. NOW, HAVE ANY OF THOSE PAPERS BEEN PUBLISHED IN ANY PEER REVIEW JOURNALS?

A. THEY'RE ALL PUBLISHED IN PEER REVIEW JOURNALS. VIRTUALLY MOST OF THEM, I SHOULD SAY. THERE ARE SOME THAT WERE GIVEN AT -- AS SOCIETY PRESENTATIONS AND THINGS OF THAT SORT, WHICH ARE PEER-REVIEWED BUT NOT PEER-REVIEWED TO THE EXTENT THAT THE PUBLICATIONS ARE.

Q. WHY DON'T WE GO THROUGH YOUR CV HERE AND, IF YOU COULD FOR ME, POINT OUT WHICH PAPERS OR WHICH PUBLICATIONS WOULD DEAL WITH THE TESTIMONY THAT YOU WOULD GIVE IN THIS CASE.

A. (PAUSE - WITNESS REVIEWS DOCUMENT)

"ASSESSMENT OF THE BIOLOGICAL PERSISTENCE OF

POLYCHLORINATED BIPHENYLS," PRESIDENT'S COUNCIL ON ENVIRONMENTAL QUALITY, ENVIRONMENTAL TASK FORCE ON PCB'S, INVITED INDUSTRY ADVISOR, WASHINGTON, D.C., MAY FIFTEENTH, 1972.

"ASSESSING POTENTIAL OCEAN POLLUTANTS," OCEAN AFFAIRS BOARD, COMMISSION ON NATURAL RESOURCES, NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STUDY PANEL MEMBER.

"BIODEGRADATION OF PHTHALATE ESTERS," REGIONAL TECHNICAL CONFERENCE, SOCIETY OF PLASTICS ENGINEERS, INVITED TECHNICAL PAPER. AS I MENTIONED EARLIER, WE WENT ON TO STUDY OTHER PRODUCTS USING THE TECHNIQUES THAT WE DEVELOPED TO STUDY THE PCB'S.

"ASSESSING POTENTIAL OCEAN POLLUTANTS," OCEAN AFFAIRS BOARD, COMMISSION ON NATURAL RESOURCES, NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, CHAIRMAN, SYNTHETIC ORGANIC CHEMICALS SECTION.

"MIGRATION OF POLYCHLORINATED BIPHENYLS IN SOIL INDUCED BY PERCOLATING WATER," BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY.

"ACTIVATED SLUDGE PRIMARY BIODEGRADATION OF POLYCHLORINATED BIPHENYLS," BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY.

"ASSESSING OCEAN POLLUTANTS, A REPORT ON ASSESSING

OCEAN POLLUTANTS," OCEAN AFFAIRS BOARD, COMMISSION ON NATURAL RESOURCES, NATIONAL RESEARCH COUNCIL, "SYNTHETIC ORGANIC CHEMICALS," CHAPTER 4, PAGE 64 THROUGH 224, NATIONAL ACADEMY OF SCIENCES.

"ACTIVATED SLUDGE DEGRADATION OF ADIPIC ACID ESTERS," APPLIED MICROBIOLOGY.

"BIODEGRADATION OF PHTHALATE ESTERS IN RIVER WATER AND ACTIVATED SLUDGE," APPLIED MICROBIOLOGY.

"IDENTIFICATION AND ANALYSIS OF ORGANIC POLLUTANTS IN WATER," "SEPARATION OF TRACE ORGANIC COMPOUNDS FROM WATER," CHAPTER 8, ANN ARBOR SCIENCE PUBLISHERS.

"TISSUE RESIDUES FROM SUBACTIVE ORAL FEEDING OF BIPHENYL DIALECTIC FLUIDS," BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY.

"ENVIRONMENTAL FATE OF SELECTED PHOSPHATE ESTERS," ENVIRONMENTAL SCIENCE AND TECHNOLOGY.

"EVALUATION OF EPA SW-846 GAS CHROMATOGRAPHY/MASS SPEC METHODS 8240 AND 8270 FOR ANALYSIS OF VOLATILE AND SEMI-VOLATILE HALOGENATED ORGANIC CONSTITUENTS." INTERNATIONAL ASSOCIATION OF ENVIRONMENTAL TESTING LABORATORIES, "MIXED WASTE COMMITTEE OBJECTIVES." INTERNATIONAL ASSOCIATION OF ENVIRONMENTAL TESTING LABORATORIES, MIXED WASTES STAKEHOLDERS WORKSHOP.

"MANAGEMENT OF LABORATORY RADIOACTIVE AND MIXED

WASTES GENERATED VIA ANALYSIS OF DOE SAMPLES."
ALL OF THESE HAVE TO DO WITH TESTING.
INTERNATIONAL ASSOCIATION OF ENVIRONMENTAL TESTING LABORATORIES, "FEDERAL FACILITIES COMPLIANCE ACT."
AND THE AIR-MONITORING.
A PERFORMANCE EVALUATION OF A GC BASED CONTINUOUS AIR MONITORING SYSTEM USED DURING A SUPERFUND SITE REMEDIATION.
APPLICATION OF REAL-TIME AMBIENT AIR GC FENCE-LINE NETWORK MONITORING TO A SUPERFUND REMEDIATION PROGRAM.
THOSE WOULD BE THE KINDS OF PUBLICATIONS THAT WOULD HAVE BEARING.

Q. YOU STATE THAT YOUR OPINIONS WILL BE BASED ON YOUR INVOLVEMENT IN THE DEVELOPMENT OF NEW, COMPLEX ANALYTICAL TECHNIQUES IN THE LATE SIXTIES AND SEVENTIES CAPABLE OF IDENTIFYING AND QUANTIFYING MINUTE QUANTITIES OF CHEMICALS IN THE ENVIRONMENT.
HAVE WE TALKED ABOUT THAT?

A. YES.

Q. YOU ALSO STATE THAT YOU WILL TESTIFY FROM AN ANALYTICAL PERSPECTIVE IN THE DETAILS OF MONSANTO'S RESPONSE TO THE DISCOVERIES BASICALLY BY THE SWEDES.
HAVE WE TALKED ABOUT ALL OF MONSANTO'S RESPONSES THAT YOU'VE BEEN INVOLVED IN?

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A. I DON'T THINK THE LIST WAS EXHAUSTIVE, BUT WE COVERED THE WATERFRONT.

Q. YOU'LL TESTIFY REGARDING YOUR INVOLVEMENT IN THE DEVELOPMENT AND USE OF ANALYTICAL EQUIPMENT TO DETECT PCB'S. WE'VE TALKED ABOUT THAT; IS THAT CORRECT?

A. YES.

Q. WE'VE TALKED ABOUT YOUR INVESTIGATION AND TESTING OF PCB BIODEGRADATION; IS THAT CORRECT?

A. YES.

Q. ONE THING WE HAVEN'T TALKED A LOT ABOUT IS YOUR CONTACTS WITH THE SCIENTIFIC COMMUNITY CONCERNING SCIENTIFIC ISSUES RELATING TO PCB AND THE DEVELOPMENT OF SCIENTIFIC INFORMATION REGARDING THE PRESENCE OF PCB'S IN THE ENVIRONMENT. WHAT CONTACT DID YOU HAVE WITH THE SCIENTIFIC COMMUNITY?

A. DURING THE PERIOD OF TIME THAT WE WERE DEVELOPING THE METHODOLOGY WE HAD CONTACT WITH VIRTUALLY ALMOST EVERYBODY IN THE SCIENTIFIC COMMUNITY THAT WAS INTERESTED IN THE SAME THINGS THAT WE WERE. THAT CONTACT CAME THROUGH QUESTIONS FROM THEM TO US AS TO WHAT WERE THE ANALYTICAL PROPERTIES OF THESE MATERIALS. AS YOU POINTED OUT, WE WERE THE SOLE U.S. MANUFACTURER OF THESE MATERIALS, AND AT THAT POINT IN TIME, YOU KNOW, WE HAD THE STANDARDS THAT

THEY NEEDED AND THINGS OF THAT SORT, SO THEY CONTACTED US. THEY SHARED THEIR INFORMATION WITH US. WE CONTACTED THEM. WE SHARED OUR INFORMATION WITH THEM. IF THEY HAD QUESTIONS, WE TRIED TO ANSWER THEM. WE SHARED DRAFT METHODOLOGY. WHEN THEY HAD PROBLEMS IMPLEMENTING THE METHODOLOGY WE DEVELOPED, WE WORKED WITH THEM CLOSELY, PROVIDED THEM SOLUTIONS TO THEIR PROBLEMS, GOT THEM ON THE RIGHT TRACK. WE EXCHANGED SAMPLES VERY FREQUENTLY. ALL OF THE THINGS THAT'S NORMALLY DONE IN THE SCIENTIFIC COMMUNITY WHEN THERE'S A PROBLEM THAT EVERYBODY IS INTERESTED AND WE'RE TRYING TO FIGURE OUT WHAT'S GOING ON.

Q. NOW, ARE YOU TALKING IN A GENERAL SENSE YOUR CONTACT, OR ARE THERE ANY SPECIFIC CONTACTS REGARDING THE SCIENTIFIC COMMUNITY THAT YOU PLAN ON TESTIFYING ABOUT?

A. RIGHT NOW I'M TALKING ABOUT IN A GENERAL MANNER. WE HAD COMMUNICATIONS WITH THE HEADS OF ALL THE EPA AQUATIC LABORATORIES. I VISITED THOSE LABS. I TALKED WITH THOSE FOLKS. WE DISCUSSED WHAT PCB'S WERE, WHAT THEY MIGHT BE DOING, WHAT THEIR FINDINGS WERE, WHAT OUR FINDINGS WERE. WE HAD A VERY CONCERTED EFFORT TO SHARE OUR INFORMATION AND LEARN AS MUCH AS WE CAN FROM OTHER PEOPLE SO WE DIDN'T

HAVE TO RE-INVENT THE WHEEL.

I THINK I'VE ANSWERED YOUR QUESTION.

Q. OKAY.

YOU WILL ALSO FURNISH BACKGROUND INFORMATION REGARDING ANALYTICAL TECHNIQUES AND THE BEHAVIOR AND PROPERTIES OF PCB'S. WHAT DO YOU MEAN BY THAT STATEMENT?

A. WE DISCUSSED ABOUT HOW WE FOUND IT ADVISABLE TO BEGIN TO UNDERSTAND ENVIRONMENTAL TRANSPORT OF PRODUCTS THAT WEREN'T INTENTIONALLY SPREAD AROUND LIKE DDT AND PESTICIDES, AND SO WE BEGAN TO LOOK AT WATER SOLUBILITY. WE BEGAN TO LOOK AT BIOTRANSFORMATION. WE BEGAN TO LOOK AT A VARIETY OF THINGS. WE PARTICIPATED WITH OTHER FOLKS IN TERMS OF PROVIDING THE METHODOLOGY THAT THEY USED TO STUDY THESE THINGS, AS WELL AS THE STANDARDS.

Q. MOST EVERYTHING SO FAR IN HERE THAT WE'VE REVIEWED IN YOUR REPORT SEEMS TO BE MOSTLY THE FACTS AND THE THINGS THAT YOU DID WHEN YOU WERE EMPLOYED BY MONSANTO. IS THAT A FAIR STATEMENT?

A. I THINK THERE'S A FAIR AMOUNT OF TECHNICAL EXPERT THINGS THAT WE'VE REVIEWED TOO, SO I THINK YOU'RE PARTLY CORRECT.

Q. IS THERE ANYTHING IN A GENERAL SENSE THAT'S IN YOUR REPORT THAT WE HAVEN'T DISCUSSED ALREADY?

A. NO. YOU'VE BEEN VERY MUCH THROUGH THE REPORT WORD BY WORD.

Q. NOW, IT'S MY UNDERSTANDING ALSO THAT YOU WILL OR PLAN ON OR HAVE REVIEWED THE DATA FROM THE PLAINTIFFS' EXPERTS. IS THAT CORRECT?

A. I'VE BEEN ASKED TO REVIEW THAT DATA, YES.

Q. HAVE YOU REVIEWED ANY DATA SO FAR?

A. NO. AS I BELIEVE WAS STATED EARLIER, THAT I HAD NOT COMPLETED THE EVALUATION OF IT.

Q. WHAT DATA HAVE YOU STARTED TO EVALUATE?

A. YOU HAVE A COPY OF IT.

Q. WELL, LET'S GO THROUGH IT. AND AS A PART OF THE DEPOSITION WE ASKED YOU TO PRODUCE YOUR FILE; IS THAT CORRECT?

A. THAT'S CORRECT.

Q. AND YOU'VE PRODUCED TO ME BASICALLY THREE DIFFERENT PIECES; IS THAT CORRECT?

A. WHICH IS THE FILE.

Q. AND THE FIRST ONE IS A LETTER DATED DECEMBER FIRST, 1998, TO BUDDY COX FROM DONALD STEWART, WHICH IS BASICALLY THE BONNER ANALYTICAL TESTING RESULTS FOR SOIL SAMPLES OF THE PLAINTIFFS' PROPERTIES; IS THAT CORRECT?

A. CORRECT. IT'S THE SUMMARY OF THE ANALYTICAL SAMPLING OF 168 PIECES OF PROPERTY AND THE

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ANALYTICAL RESULTS AS REPORTED BY BONNER.

Q. AND THAT'S WHAT YOU'VE BEEN REVIEWING OR STARTED TO REVIEW; IS THAT CORRECT?

A. THIS IS WHAT I LOOKED THROUGH AND LOOKED AT.

Q. HOW MUCH TIME HAVE YOU SPENT LOOKING THROUGH AND LOOKING AT IT?

A. I WOULD GUESS FOUR TO EIGHT HOURS.

Q. HAVE YOU FOUND ANY OR HAVE ANY CRITICISMS OF THE DATA THAT YOU'VE SEEN SO FAR?

A. WHAT I'VE FOUND SO FAR SAYS TO ME THAT IT'S A NICE SUMMARY PACKAGE, AND IT HAS ALL OF THE ELEMENTS OF A SUMMARY PACKAGE THAT A CLIENT MIGHT WANT TO RECEIVE. IT DOES NOT HAVE THE ELEMENTS THAT ARE REQUIRED TO VERIFY THE ANALYTICAL INFORMATION, AND SO I'VE SUGGESTED THAT IT WOULD BE A GOOD IDEA TO REQUEST THE KIND OF INFORMATION THAT AN ANALYTICAL CHEMIST WOULD LOOK AT TO VERIFY THE INFORMATION AND TO DETERMINE THAT IT MAKES SENSE, THAT IT WAS DONE THE WAY IT WAS SUPPOSED TO BE DONE, THAT IT WAS INTERPRETED PROPERLY, THAT IT WAS CALCULATED PROPERLY, THAT THE PROPER METHOD DETECTION LIMITS WERE DETERMINED AND USED, THAT PRACTICAL QUANTITATIONS WERE IN PLACE, THE CONTINUING CALIBRATIONS WERE DONE RIGHT, THAT THE INITIAL CALIBRATIONS WERE RIGHT, THOSE KINDS OF THINGS.

Q. AND WHAT WILL YOU LOOK AT TO SEE IF THAT WAS DONE PROPERLY?

A. I WILL LOOK AT THE RECORDS THAT THE LABORATORY IS REQUIRED TO GENERATE, IF THEY PERFORMED THESE IN ACCORDANCE WITH THE ENVIRONMENTAL PROTECTION AGENCY METHODOLOGY, WHICH I'M SURE THEY DID.

Q. OTHER THAN BONNER DO YOU PLAN ON REVIEWING OR ARE YOU AWARE THAT YOU WILL BE REVIEWING ANY OTHER OF THE PLAINTIFFS' EXPERTS?

A. I THINK THE POSSIBILITY EXISTS. I'M NOT AWARE OF IT AT THE MOMENT.

Q. YOU'VE NOT RECEIVED ANY OTHER DATA FROM ANY OTHER OF THE PLAINTIFFS' EXPERTS?

A. NO.

Q. OKAY.

A. YOU HAD ASKED ME TO PRODUCE THE FILE OF THE DATA I RECEIVED. THIS IS IT. SO IF THAT WAS YOUR QUESTION, YOU GOT IT.

BY MR. PRAUSE:

AND THAT'S LIMITED TO THIS CASE.

BY MR. FELL:

THIS CASE, YES. THE ABERNATHY CASE.

BY MR. PRAUSE:

YOU SAID "PLAINTIFFS."

DIRECT EXAMINATION RESUMED BY MR. FELL:

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Q. YOU ALSO PRODUCED AS PART OF YOUR FILE, IT LOOKS LIKE, PLAINTIFFS' RESPONSE TO MONSANTO'S REQUEST FOR ADMISSIONS AS WELL AS THE PLAINTIFFS' RESPONSE TO THE SECOND INTERROGATORIES AND SECOND PRODUCTION OF DOCUMENTS, AND IT LOOKS LIKE IT HAS THE PLAINTIFFS' EXPERTS LISTED IN THERE. IS THAT CORRECT?

A. IT HAS SOME.

Q. SOME OF THEM.

A. I'M NOT SURE IT HAS IT ALL. THAT'S CORRECT.

Q. HAVE YOU REVIEWED THAT?

A. YES, I HAVE.

Q. AND WHAT INFORMATION DID YOU FIND OF INTEREST IN THAT?

A. I WAS NEVER ASKED TO DRAW ANY CONCLUSIONS FROM THE INFORMATION. I WAS ONLY ASKED TO REVIEW IT.

Q. AND ALSO AS A PART OF YOUR FILE YOU HAVE A FOLDER MARKED "DYER PLAINTIFFS"; IS THAT CORRECT?

A. THAT'S CORRECT.

Q. AND IT LOOKS LIKE IT'S JUST THE DEFENDANTS' NOTICE OF FILING EXPERT DISCLOSURES AND REPORTS. IS THAT CORRECT?

A. THAT'S CORRECT.

Q. AND IT HAS EXHIBITS "A" THROUGH "M" ON IT; IS THAT RIGHT?

A. THAT'S CORRECT.

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Q. HAVE YOU REVIEWED THAT?

A. I HAVE READ AND REVIEWED, YES.

Q. WHAT CONCLUSIONS HAVE YOU REACHED, IF ANY, FROM THAT?

A. I CONCUR WITH THE CONCLUSIONS IN MOST INSTANCES, IF NOT ALL INSTANCES, THAT WERE DRAWN BY THE EXPERTS IN THOSE. AS I SAID, I'VE BEEN THROUGH IT TWICE. SOME OF THE AREAS ARE OUTSIDE MY SPECIFIC AREA OF EXPERTISE, BUT BASED ON MY FAMILIARITY WITH THE STUFF I HAVE NO REASON TO BELIEVE THAT WHAT I READ THERE WASN'T OKAY. ON THE OTHER HAND, I'VE NOT BEEN ASKED TO OFFICIALLY FORMULATE ANY OPINIONS ON THIS OR TO APPLY MY ANALYTICAL EXPERTISE TO THAT FILE.

BY MR. FELL:

WHY DON'T WE TAKE A LITTLE BREAK.

(SHORT BREAK)

DIRECT EXAMINATION RESUMED BY MR. FELL:

Q. DOCTOR, WE TALKED ABOUT THE FACT THAT -- THE PROGRESSION OF BEING ABLE TO ANALYZE FOR TRACE PCB CONCENTRATIONS IN THE ENVIRONMENT. IT'S NOT GOING TO BE YOUR TESTIMONY THAT THOSE LEVELS IN THE ENVIRONMENT IN ANNISTON ARE NOT A LEVEL OF CONCERN; IS THAT CORRECT?

A. FROM AN EXPERT VIEWPOINT CERTAINLY NOT. AS I'VE INDICATED TO YOU EARLIER, I'M NOT A TOXICOLOGIST IN

TERMS OF THOSE KINDS OF THINGS, SO I DON'T TESTIFY ON THE TOXICOLOGICAL ASPECTS OF THE -- OR THE TOXICITY ASPECTS OF ANY CHEMICALS, SO, TO THAT EXTENT, NO.

Q. DO YOU PLAN ON TESTIFYING THAT THE TEST RESULTS THAT WERE FOUND ON THE PLAINTIFFS' PROPERTY WERE THE RESULT OF PCB'S BEING UBIQUITOUS IN THE ENVIRONMENT AND NOT AS A RESULT OF CONTAMINATION FROM THE MONSANTO PROPERTY?

A. I THINK WHAT I'VE SAID TO YOU EARLIER IS THAT I'VE NOT HAD A CHANCE TO REVIEW THE INFORMATION IN DETAIL AND THAT I NEED A NUMBER OF OTHER THINGS TO REVIEW THAT INFORMATION PROPERLY. SO, AS I'VE INDICATED EARLIER, I HAVE NOT FORMULATED AN EXPERT OPINION ON THAT PARTICULAR PIECE OF DATA OR SET OF INFORMATION. I WILL DO SO, AND, AS I THINK MARSH HAS INDICATED TO YOU, THAT WHEN THAT'S DONE YOU'LL BE APPRAISED (SIC) OF IT AND THINGS OF THAT SORT. IS THAT WHAT YOU'RE ASKING?

Q. WELL, NO. DO YOU PLAN ON SAYING WHETHER THESE ARE, QUOTE/UNQUOTE, "BACKGROUND" LEVELS, OR DO YOU JUST PLAN -- MY UNDERSTANDING OF WHAT YOU WERE SUPPOSED TO DO IS REVIEW THIS TO MAKE SURE THAT THIS WAS PROPERLY DONE.

A. THE FIRST THING I NEED TO DO IS REVIEW THE

INFORMATION. I HAVE NOT REVIEWED THE INFORMATION, AS WE'VE SAID TO YOU, SO I CAN'T DRAW ANY CONCLUSIONS UNTIL -- IT WOULD BE INVALID FOR ME TO DRAW ANY CONCLUSIONS UNTIL I'VE HAD A CHANCE TO PROPERLY VALIDATE THE INFORMATION AND REVIEW IT, AT WHICH TIME I'M SURE THAT I'LL WRITE DOWN WHAT MY CONCLUSIONS ARE AND WE'LL SHARE THOSE. IS THAT ---

Q. DO YOU THINK IT'S WITHIN YOUR EXPERTISE TO ---

A. I HAVE NOT DRAWN ANY CONCLUSIONS YET BECAUSE I HAVE NOT REVIEWED THE INFORMATION.

Q. MY UNDERSTANDING OF WHAT WAS RESERVED WAS YOUR ABILITY TO DETERMINE WHETHER THESE SAMPLES WERE PROPERLY ANALYZED OR NOT. DO YOU PLAN ON DOING MORE THAN THAT?

A. I WOULD HAVE TO DEFER TO COUNSEL AS TO WHAT WAS RESERVED, AND SO IF THAT'S A QUESTION TO ME, YOU'RE ASKING THE WRONG PERSON.

I'M GOING TO REVIEW THAT DATA PACKAGE AND MAKE SURE, FIRST OF ALL, THAT THE INFORMATION HAS BEEN GENERATED PROPERLY.

Q. OKAY.

A. ONCE I'M SURE THE INFORMATION IS GENERATED PROPERLY THEN I'M GOING TO LOOK AT IT AND SEE IF IT MAKES SENSE. AND I'M GOING TO LOOK AT IT IN TERMS OF LOOKING AT THE INDIVIDUAL CHROMATOGRAM AND MAKE SURE

THEY'VE BEEN INTERPRETED PROPERLY AND MAKING SURE THAT THE SENSITIVITY IS RIGHT, MAKING SURE THE CALCULATIONS ARE RIGHT. NOW, WHEN THAT'S ALL DONE, WHAT THE DATA TELLS ME, I'LL PROBABLY FORMULATE AN OPINION ON THAT; BUT UNTIL THAT'S DONE I CAN'T PROPERLY FORMULATE AN OPINION.

Q. WHAT TYPES OF CONCLUSIONS DO YOU BELIEVE THAT YOU CAN REACH FROM DATA OF THIS TYPE WITHIN YOUR EXPERTISE?

A. I THINK THE CONCLUSIONS THAT I CAN REACH FROM THAT DATA RUNS THE GAMUT, DEPENDING UPON MY EVALUATION OF THE INFORMATION AFTER I'VE DETERMINED THAT THE DATA IS DEFENSIBLE, THAT IT'S BEEN PRODUCED PROPERLY, AND THAT KIND OF THING. I THINK I'VE ANSWERED YOUR QUESTION. I CAN'T FORMULATE OPINIONS ON INFORMATION I HAVEN'T REVIEWED OR THAT I'M NOT SURE WAS GENERATED PROPERLY. I THINK IT WOULD BE A TRAVESTY FOR ME TO TRY TO DO THAT FOR YOU RIGHT NOW.

Q. WHAT I'M TRYING TO ASK IS WHAT YOUR EXPERTISE IS. DO YOU BELIEVE IT'S WITHIN YOUR EXPERTISE TO RENDER AN OPINION OF WHETHER THESE SAMPLES REPRESENT SIMPLY FINDING PCB'S IN UBIQUITOUS AMOUNTS IN THE ENVIRONMENT OR WHETHER THIS IS FROM THE MONSANTO FACILITY? IS THAT WITHIN YOUR EXPERTISE?

A. IS THAT POSSIBLE? SURE.

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Q. THAT'S WITHIN YOUR EXPERTISE?
A. YES.
Q. HOW WOULD YOU GO ABOUT MAKING THAT OPINION?
A. OKAY. YOU'VE ADDED AN EXTRA -- RE-ASK ME WHAT YOU ASKED, BECAUSE YOU DID -- YOU ADDED A LITTLE EXTRA THING AT THE END THERE THAT I MAY HAVE. . .
Q. MY UNDERSTANDING OF WHAT YOU WERE SUPPOSED TO DO WAS JUST TO EVALUATE TO MAKE SURE EVERYTHING WAS DONE PROPERLY AND WHETHER THIS WAS GOOD DATA. BUT YOU'RE TELLING ME THAT YOU WERE -- IT'S YOUR UNDERSTANDING YOU WERE SUPPOSED TO DO MORE THAN THAT; IS THAT CORRECT?
A. IT'S NOT MY UNDERSTANDING AT THIS POINT IN TIME, AND DRAWING ANY FURTHER CONCLUSIONS FROM THAT INFORMATION DEPENDS UPON VALIDATING IT. FOR EXAMPLE, IF I WENT THROUGH IT AND FOUND OUT THAT REALLY NONE OF THOSE THINGS IN THERE -- THIS IS CERTAINLY HYPOTHETICAL -- THAT NONE OF THE THINGS IN THE REPORT OF THE PCB'S WERE, IN MY OPINION, NOT PCB'S, THEN I CERTAINLY WOULD HAVE AN OPINION ON IT AND THE CONCLUSIONS THAT COULD BE DRAWN FROM IT.
Q. LET'S ASSUME FOR A MINUTE THAT THEY ARE ALMOST ALL VALID. I'M SURE YOU CAN PROBABLY FIND ONE OR TWO DISCREPANCIES IN THERE. LET'S ASSUME ---
A. I'M NOT SURE WHAT I CAN FIND, AND I THINK I'VE

ALREADY STATED THAT.

Q. ONCE THE -- I'M TRYING TO FIGURE OUT WHAT THE NEXT OPINION IS GOING TO BE, IF IT'S JUST GOING TO BE "THIS DATA IS GOOD" OR "THIS DATA IS BAD" OR WHAT ELSE IT WOULD BE.

A. I HAVE THE EXPERT CAPABILITY TO DRAW OTHER CONCLUSIONS, DEPENDING UPON HOW THE DATA TURNS OUT, AND I'D HATE TO TRY TO TELL YOU UP-FRONT EXACTLY WHAT I'M GOING TO -- THE CONCLUSIONS I'M GOING TO DRAW WHEN I HAVEN'T HAD TIME TO EVALUATE THE DATA.

Q. WHAT WILL YOU EVALUATE THE DATA FOR?

A. AS I'VE INDICATED EARLIER, FIRST OF ALL I'LL EVALUATE TO SEE WHETHER OR NOT IT WAS GENERATED PROPERLY. SECONDLY, I'LL EVALUATE IT TO SEE THAT THE CONCENTRATIONS ARE CORRECT. THIRDLY, I'LL EVALUATE IT TO SEE THAT THE TYPE OF PCB'S THAT ARE IDENTIFIED THERE ARE REAL. I'LL IDENTIFY WHETHER OR NOT THERE ARE INTERFERENCES, WHETHER OR NOT THE LEVELS THAT ARE CALCULATED ARE CORRECT, WHETHER OR NOT THE METHOD DETECTION LIMITS WERE DETERMINED PROPERLY, ALL OF THOSE THINGS. NOW, THE POSSIBILITY EXISTS THAT METHOD DETECTION LIMITS MAY NOT HAVE BEEN DETERMINED PROPERLY, AND IF THEY HAVEN'T, THEN THAT MAY CHANGE THE WHOLE MEANING OF THAT DATA SET. SO THAT'S WHAT I'M TRYING TO SAY. I CAN TELL YOU

THE KINDS OF THINGS I LOOK FOR, AND I CAN TELL YOU THE KINDS OF THINGS THAT I DO. I CANNOT TELL YOU THE CONCLUSIONS I'M GOING TO DRAW FROM DATA I HAVEN'T EVALUATED YET. THAT INFORMATION NEEDS TO BE GENERATED IN A CERTAIN MANNER, IN ACCORDANCE WITH THE EPA RECOMMENDATIONS AND METHODOLOGY. SOME OF THOSE THINGS ARE PRETTY DISASTROUS IF THEY'RE NOT DONE CORRECTLY AND THEY MAY -- THEY INVALIDATE THE INFORMATION. IF SOME OF THE THINGS ARE NOT SO DISASTROUS, IT MAY NOT INVALIDATE THE INFORMATION BUT MAY REQUIRE SOME INTERPRETATION.

I CAN SEE BY THE EXPRESSION ON YOUR FACE THAT I'M APPARENTLY NOT ANSWERING THE QUESTION THE WAY ---

Q. I INTENDED IT. CORRECT.

A. CORRECT.

Q. MY QUESTION IS -- TO ME, WHAT YOU'RE TELLING ME YOU'RE GOING TO EVALUATE THIS FOR IS WHETHER THIS IS VALID DATA AND IF IT'S INVALID, YOU WILL RENDER AN OPINION ON WHAT EFFECT THAT WOULD HAVE, BUT THAT'S THE EXTENT OF IT. OR ARE YOU TELLING ME THAT THERE'S MORE?

A. I'M NOT SURE WHAT YOU'RE TRYING TO -- WHY YOU'RE TRYING TO LIMIT ME IN TERMS OF THE CONCLUSIONS I MAY DRAW FROM DATA I HAVEN'T EVALUATED YET, BUT THAT'S THE FEELING I GET.

I THINK I'VE BEEN STRAIGHTFORWARD AND HONEST ABOUT THE EVALUATION I'M GOING TO DO. ONCE THAT EVALUATION IS DONE AND THE DATA IS CORRECT FROM MY VIEWPOINT THEN I'LL LOOK AT THAT DATA AND SEE IF IT MAKES SENSE.

Q. AND WHAT DO YOU MEAN BY "MAKES SENSE"?

A. IN TERMS OF THE TYPES OF PCB'S THAT ARE BEING FOUND, IN TERMS OF THE ISOMER DISTRIBUTION, IN TERMS OF POTENTIAL INTERFERENCES, THOSE KINDS OF THINGS. IS IT AN APPLE OR IS IT AN ORANGE? IF IT'S A CAR, IT OUGHT TO HAVE FOUR TIRES. THOSE KINDS OF THINGS. IF IT'S NOT -- IF IT'S A CAR AND IT ONLY HAS THREE, THAT'S A POSSIBILITY.

Q. WHAT TYPES OF PCB'S DO YOU EXPECT TO BE FOUND BASED UPON THE ANNISTON PLANT?

A. I'M NOT PREPARED TO REALLY ANSWER THAT AT THIS POINT IN TIME. I NEED TO LOOK AT THE INFORMATION -- I DON'T KNOW HOW MANY TIMES I NEED TO SAY THAT TO YOU -- BEFORE I DRAW CONCLUSIONS.

Q. WILL YOU AGREE WITH ME THAT EVEN THOUGH CERTAIN ISOMERS AREN'T FOUND IN THE TISSUE OF MAYBE A HUMAN OR AN ANIMAL, THAT THAT DOESN'T MEAN THAT THAT HUMAN OR ANIMAL WASN'T EXPOSED TO THAT PARTICULAR ISOMER?

A. THAT'S KIND OF A NEGATIVE, AND IT CERTAINLY DOESN'T MEAN THAT THE HUMAN WAS EXPOSED TO THAT ISOMER. IT

MEANS THAT THE HUMAN COULD'VE BEEN EXPOSED AND IT WAS METABOLIZED. SO I GUESS I CAN AGREE WITH YOU OR DISAGREE WITH YOU, AND I CAN AGREE WITH YOU FOR SURE IF YOU'LL ALLOW THE QUALIFICATION THAT I JUST STATED.

Q. OKAY.

IT'S MY UNDERSTANDING YOU'VE NEVER BEEN TO ANNISTON. IS THAT CORRECT?

A. THAT'S CORRECT.

Q. DO YOU PLAN ON GOING TO ANNISTON?

A. I WOULD ASSUME THAT I PROBABLY WILL GO TO ANNISTON.

BY MR. FELL:

THAT'S ALL I HAVE.

BY MR. PRAUSE:

I HAVE NO FURTHER QUESTIONS.

[THERE BEING NO FURTHER QUESTIONS, THIS DEPOSITION WAS CONCLUDED AT APPROXIMATELY 4:35 P.M.]

IN THE CIRCUIT COURT OF CALHOUN COUNTY, ALABAMA

SABRINA ABERNATHY, ET AL.,

PLAINTIFFS, CIVIL ACTION CV-96-269

VS. (CONSOLIDATED)

MONSANTO COMPANY, ET AL.,

DEFENDANTS.

CERTIFICATE

THIS IS TO CERTIFY THAT THE FOREGOING DEPOSITION OF E. SCOTT TUCKER, III WAS TAKEN BY THE WITHIN COURT REPORTER, A NOTARY PUBLIC FOR THE STATE OF SOUTH CAROLINA, DULY COMMISSIONED AND QUALIFIED AS SUCH, ON JANUARY 5, 1998, AT THE OFFICE OF CLARKSON, FORTSON, WALSH & RHENEY, 117 MANLY STREET, GREENVILLE, SOUTH CAROLINA.

THAT SAID COURT REPORTER IS NOT A RELATIVE OR EMPLOYEE OF ANY OF THE PARTIES OR THE ATTORNEYS, AND FURTHER, IS NOT OF COUNSEL OR ATTORNEY FOR ANY OF THE PARTIES TO SAID ACTION, AND, IS NOT IN ANY MANNER INTERESTED IN THE CAUSE, FINANCIAL OR OTHERWISE.

THAT THE DEPONENT WAS DULY PLACED UNDER OATH AND ADMONISHED TO SPEAK THE WHOLE TRUTH. THAT THE ORAL DEPOSITION WAS DULY TAKEN AND TRANSCRIBED AS TO THE QUESTIONS PROPOUNDED AND THE ANSWERS GIVEN, THAT THE FOREGOING 147 PAGES IS A TRUE, ACCURATE, AND CORRECT RECORD OF THE TESTIMONY GIVEN BY THE DEPONENT TOGETHER

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WITH SUCH CHANGES AS SAID DEPONENT MAY HAVE MADE, IF ANY, DURING THE READING OVER AND SIGNING PROCEDURE.

THAT THE COURT REPORTER HAS RETAINED THE ORIGINAL DEPOSITION IN ITS POSSESSION FOR THE PURPOSE OF SEALING AND FILING SAME WITH THE PROPER OFFICIAL.

THAT ALL OFFERED EXHIBITS, STIPULATIONS AND OBJECTIONS, IF ANY, INVOLVED IN THIS CAUSE ARE DULY ATTACHED OR INCLUDED HEREIN.

IN WITNESS WHEREOF, I HAVE SET MY HAND AND OFFICIAL SEAL.

DATE: January 19, 1999

_____

NOTARY PUBLIC FOR SOUTH CAROLINA

MY COMMISSION EXPIRES 9/15/2002

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