IN THE

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1970

No. 48 Original

STATE OF MISSISSIPPI,
Plaintiff,

vs.

STATE OF ARKANSAS,
Defendant.

RESPONSE OF THE STATE OF MISSISSIPPI TO THE EXCEPTIONS OF THE STATE OF ARKANSAS TO THE REPORT AND RECOMMENDATIONS OF THE SPECIAL MASTER

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The State of Mississippi confesses some difficulty in responding to the exceptions filed on behalf of the State of Arkansas due to the fact that Arkansas largely restates its position as argued before the Master, refers to its testimony as presented to the Master, and then argues that the Master should have decided the case in Arkansas' favor. There is an almost total lack of any reference to the overwhelming testimony submitted by the State of Mississippi in support of her position. The Special Master, in his Report, discussed the conflicting testimony at length and gave reasons why he accepted as correct the testimony of the Mississippi witnesses and rejected the testimony of the Arkansas witnesses. Although it will unduly lengthen our response, we know of no way to meet this type of argument

other than to comment to some degree on the testimony submitted by Mississippi and to make reference to the applicable court decisions to show that, in the opinion of Mississippi, the Report of the Master is not only correct, but that any other finding by the Master would be unsupported by credible evidence.

I

IF THE REPORT OF THE SPECIAL MASTER IS SUPPORTED BY SUBSTANTIAL EVIDENCE AND IS NOT CLEARLY ERRONEOUS, IT SHOULD BE APPROVED, CONFIRMED AND ADOPTED BY THIS COURT

Rule 9(2) of the Supreme Court rules provides as follows:

> "2. The form of pleadings and motions in original actions shall be governed, so far as may be, by the Federal Rules of Civil Procedure, and in other respects those rules, where their application is appropriate, may be taken as a guide to procedure in original actions in this court."

Rule 53 of the Federal Civil Rules deals with Masters and under sub-section (c)—Powers, states:

> "The order of reference to the Master may specify or limit his powers and may direct him to report only upon particular issues or to do or perform particular acts or to receive and report evidence only and may fix the time and place for beginning and closing the hearings and for the filing of the Master's report. . ."

Reference to the record will show that the Special Master has followed the provisions of Rule 53 meticulously.

Rule 53(e) (2) states:

> "In non-jury actions. In an action to be tried without a jury the court shall accept the Master's finding of fact unless clearly erroneous . . . The court after hearing may adopt the report or may modify it or may reject it in whole or in part or may receive further evidence or may recommit it with instructions."

The only case that we have found dealing with the applicability of the Federal Civil Rules to original proceedings under Rule 9, appears in the case of *State of Utah* v. *United States,* 398 U.S. 89, 95, 22 L.Ed.2d 99, 105, 89 S.Ct. 761 (1969) wherein the court stated:

> "[S]ince the Federal Rules are a guide to the conduct of original actions in this court only 'where their application is appropriate,' Rule 9(2) of the rules of court, and since our original jurisdiction should be invoked sparingly, we hold that the State of Utah may properly waive the protection of Rule 19 here."

In *Utah* the court was dealing specifically with the claim of Morton International, Inc. that it was entitled under Rule 19(a) to intervene.

While the quoted portion of the opinion simply restates the rule itself, it certainly seems to say that "where appropriate" this court will follow the Civil Rules of Procedure and this would seem to apply to the disposal of the exceptions to the Master's Report. Even in the absence of formal rules, this court has always taken the position that it had the inherent authority to prescribe its own mode and form of proceedings in cases of original jurisdiction. *Florida* v. *Georgia,* 17 How. 478, 15 L.Ed. 181 (1855).

Prior to the adoption of the Federal Rules, this Court had on numerous occasions considered the weight to

be given findings of fact by a Special Master in chancery cases and under the old equity rules. Illustrative is the case of *Metsker* v. *Bonebrake,* 108 U.S. 66, 27 L.Ed. 654, 655 (1855), which stated the rule to be:

> "The findings of the Master are *prima facie* correct. Only such matters of law and of fact as are brought before the court by exceptions are to be considered and the burden of sustaining the exceptions is on the objecting party."

The case of *Sheffield & Birmingham Coal, Iron & R. Co.* v. *Gordon,* 181 U.S. 285, 290, 38 L.Ed. 164, 165 (1893), again dealing with a Master's report in equity, laid down these requirements as to the form that the exceptions to the report should take:

> "Proper practice in equity requires that exceptions to the report of a master should point out specifically the errors upon which the party relies, not only that the opposite party may be apprised of what he has to meet, but that the master may know in what particular his report is objectionable, and may have an opportunity of correcting his errors or reconsidering his opinions. The court, too, ought not to be obliged to rehear the whole case upon the evidence, as the main object of a reference to a master is to lighten its labors in this particular. In the case of Dexter v. Arnold, 2 Sumn. 108, an exception to a report of a master that he had stated and certified that there was due on a certain mortgage a certain sum when he ought to have reported that there was nothing due, was held by Mr. Justice Story to be quite untenable. 'It is too loose and general in its terms,' said he, 'and points to no particulars. It comes to nothing, unless specific errors are shown in the report; and those errors, if they exist, should have been brought directly to the view of

> the court in the form of the exception itself. At present it amounts only to a general assignment of errors, and the argument on this exception has shown none.'
>
> "The same rule was laid down in Story v. Livingston, 38 U.S. 13 Pet. 359 [10:200], wherein the exceptions to the report of a master were held to be too general, indicating nothing but dissatisfaction with the entire report; and furnishing no specific grounds, as they should have done, wherein the defendant had suffered any wrong, or as to which of his rights had been disregarded The court observed that 'exceptions to a report of a master must state, article by article, those parts of the report which are intended to be excepted to.' The court cited with approval the case of Wilkes v. Rogers, 6 Johns. 566, wherein it was said that exceptions to reports of masters in chancery are in the nature of a special demurrer; and the party objecting must point out the error, otherwise the part not excepted to will be taken as admitted."

Although *Sheffield & Birmingham* was decided at a time when the Master submitted his first proposed draft of findings to the attorneys, the requirements that the exceptions should be specific in detail certainly should apply here where we have a record of this magnitude with the numerous exhibits which have been introduced.

The Federal Reports are replete with decisions wherein the Circuit Courts of Appeal have held that, under Rule 53(e) (2) of the Federal Rules of Civil Procedure, the findings of a Master are entitled to great weight and if they are supported by substantial evidence and are not clearly erroneous, they should be approved and adopted. *U. S.* v. *S. Polpe & Co.*, 359 F.2d 132 (1st Cir. 1966); *Baker* v. *Simmons*, 325 F.2d 580 (1st Cir. 1963); *Teasdale* v. *Prosperity Co.*, 290 F.2d 345 (8th Cir. 1961). The

logic that the findings of the Master should be adopted unless clearly erroneous is soundly founded on the fact that the Master enjoyed the advantage of personally seeing and hearing the witnesses and thus is better able to judge their veracity and credibility and the trial or appellate court should respect this advantage. *Ferroline Corp.* v. *General Aniline & Film Corp.*, 207 F.2d 912 (7th Cir. 1953); *O'Hara* v. *Murphy*, 137 F.2d 154 (1st Cir. 1943); *Howard Industries, Inc.* v. *Ray Motor Corp.*, 293 F.2d 116, 117 (7th Cir. 1961).

II

CONTENTIONS OF THE STATE OF MISSISSIPPI AND THE STATE OF ARKANSAS

In the hearing before the Master and in their trial briefs, both states agreed to the legal principle that when a navigable river constitutes the boundary between two states, the middle of the main channel of the stream constitutes that boundary. This "middle of the main channel" has been variously defined as the thalweg or the sailing channel, being that channel customarily followed by navigation.

Both states also recognized the rule of law that where the course of a boundary stream changes through the operation of the gradual processes of erosion and accretion, that the state boundary follows the stream and remains in the varying center of the navigable channel.

Both states also conceded that where a boundary stream suddenly abandons its old bed and seeks a new one, such change, termed in the law "avulsion", works no change in the boundary, but in such instance the boundary remains fixed in the middle of the old navigable channel when it last ceased to be a flowing stream.

The testimony introduced by Mississippi shows that following the original government Land Office Survey of Arkansas, made in this reach of the river in 1823, the Mississippi River migrated gradually westward for approximately a mile, reaching its point of westernmost migration circa 1908-10. This line of maximum migration, or erosion westward, is marked on the ground by the relic of the right descending bank (Arkansas) of the Mississippi River referred to as the "bank of maximum recession". The main channel of the Mississippi River flowed westward, southward and easterly around Carter Point, Mississippi continuously from 1823 until 1935 when the Mississippi River was diverted from its former bed through the dredging by the United States Engineers of a new channel across the neck of Carter Point, which new channel was referred to throughout as the Tarpley Neck Cutoff of 1935. Both Mississippi and Arkansas conceded that this 1935 diversion of the river constituted an "avulsion". This river action is clearly shown on Exhibit P-1, attached as Appendix A p. 36 to the Master's Report.

The area in which the positions of Arkansas and Mississippi differ is as follows:

(1) Mississippi contends that the migration of the Mississippi River westward from 1823 to its bank of maximum recession, referred to above, was the result of the gradual processes of accretion and erosion and that at all times during this period, the thalweg, or sailing line, upstream from the problem area, was hard against the Mississippi shore (left descending bank), coming out of Miller Bend upstream from Carter Point. This thalweg, or line of navigation, followed the Mississippi shore for approximately half the distance of the northern side of Carter Point when it then "crossed over" to the Arkansas (right descending) bank of the river as it approached Span-

ish Moss Bend. Navigation ran Spanish Moss Bend by holding hard to the Arkansas bank until the distal end of Carter Point had been passed and then again crossed over to the Mississippi bank downstream through Batchelor's Bend. The opening of the Tarplay Cutoff in 1935 was an avulsive act, which fixed the state boundary in the old sailing channel or thalweg as it was located in 1935. This location is shown on Austin B. Smith's Exhibit P-2, Appendix B, p. 37 to the Report of the Special Master.

(2) Arkansas contends that there were *two* avulsions, one in the year 1871 and the other being the avulsion of 1935. Arkansas contends that there was no migration westward of the Mississippi River from 1823 until 1871 and that in the year 1871 the river suddently left its former bed in Spanish Moss Bend and adopted a new bed to the west, leaving an island formation consisting of original Arkansas mainland between the old and new beds of the Mississippi River. This land formation is designated by Arkansas as being Luna Island. It is Arkansas' contention that while Smith's boundary line, Exhibit P-2, may be correct along the northern and southern sides of Carter Point, it is in error as it loops old Spanish Moss Bend and should be located somewhere between Luna "Island" and the western or distal end of Carter Point, Mississippi. Arkansas failed to introduce an exhibit showing with any degree of certainty her conception of where the state line should be located.

(3) Mississippi controverts Arkansas' contention as to the 1871 avulsion and contends that as the river migrated westward through the gradual process of accretion and erosion, that alluvion was deposited on the distal end of Carter Point as pointbar accretions. The growth of this accreted material was concomitant to and concurrent with the erosion of the Arkansas right descending bank. The existence and growth of this pointbar accretion is graphically shown

on the early river maps, The Western Pilot, 1825, Exhibit P-7, ibid, 1834, Exhibit P-8, ibid, 1841, Exhibit P-9, ibid, 1847, Exhibit P-10, James River Guide, 1856, Exhibit P-11; and particularly Lloyd's 1863 map, Exhibit P-17. Between 1863 and 1872 as shown on Douglas' 1872 map, Exhibit P-24, a shallow pointway channel first began developing across this pointbar accretion. This pointbar was attached to the Mississippi original Carter Point by a low land bridge which could be easily forded during low water stages and in fact, during 1894 was actually entirely above water when the Mississippi was at zero stage on the Arkansas City gage. Cattle crossed over from Carter Point to Luna Bar during low water up to the time of Tarpley Neck Cutoff. Navigation never used this pointway channel except during periods of extreme high water and then only by small boats of shallow draft. It is Mississippi's contention that this land mass, between the distal end of Carter Point proper and the Arkasnas bank, had its genesis as pointbar accretions and it is referred to by Mississippi as Luna Bar. It is a detached bar formation and not an island, as such.

III

BASIC LAW

(a) When, as here, a navigable river forms a boundary separating one state from another the live and varying thalweg, or middle of the main navigable channel, of that river marks the boundary between the states and is to be taken as the true boundary line.

As Mississippi and Arkansas came into the United States by their respective Acts of Congress, the Mississippi River was designated as their boundary.

In the Acts of Congress admitting Arkansas and Mississippi as states into the Union, "up the middle of the main channel of the Mississippi River" was the term used in Arkansas' act of admission (5 Stat. at 2, 50, 51, Chap. 100) and "up the river" was used in Mississippi's act of admission (3 Stat. at L, p. 348, Chap. 23), reference being made to the Mississippi River.

In interpreting similar statutes, where the state boundary is the river, *Iowa* v. *Illinois*, 147 U.S. 1, 57 L.Ed. 55, 13 S.Ct. 239, extensively reviewed the authorities on the subject and held:

> "[T]hat the true line in navigable rivers between the states of the Union which separates the jurisdiction of one from the other is the middle of the main channel of the river. Thus the jurisdiction of each state extends to the thread of the stream, that is, to the 'mid-channel', and, *if there be several channels, to the middle of the principal one, or, rather, the one usually followed.*" (Emphasis supplied)

In *Iowa* v. *Illinois*, supra, the following rule for establishing the location of the thalweg is quoted:

> "If there be more than one channel of a river, the deepest channel is regarded as the navigable mid-channel for the purpose of territorial demarcation; *and the boundary line will be the line drawn along the surface of the stream corresponding to the line of deepest depression of its bed.*" (Emphasis supplied)

In *New Jersey* v. *Delaware*, 291 U.S. 361, 78 L.Ed. 847, 54 S.Ct. 407, the following definition is given:

> "The Thalweg, or downway, is the track taken by boats in their course down the stream, which is that of the strongest current."

That there is no real conflict in the two definitions is demonstrated by the able discussion of the subject by Judge Sibley of the U. S. Court of Appeals, Fifth Circuit, in the case of *Anderson-Tully* v. *Tingle,* 166 F.2d 224, wherein it was stated:

> "It appears that the older cases speak of the 'center of the stream' or 'the thread of the current' as the boundary. The center of the stream is assumed to be the same as the thread of the current if it is not shown otherwise. In Iowa v. Illinois, 147 U.S. 1, the term 'thalweg' of the stream was used, and the later cases in Mississippi use that term, as did the district court. The word is German for 'valleyway' and means the lowest part of the river bed in the direction of its flow, or the deep channel of the river. It can be, and in making charts is, accurately located by transverse soundings. The thalweg and the thread of the stream are related as cause and effect. If the bed is hard, as rock, the thalweg will direct the thread of the stream. If the bed is sand and mud, the thread of the current will control the thalweg, shifting it by erosion as the current shifts. As boundaries the two signify the same thing, the thalweg being more accurately ascertainable. We will use that term."

The basis for the foregoing rule of the thalweg has been set forth by Justice Cardozo in the case of *New Jersey* v. *Delaware,* supra:

> "The underlying rationale of the doctrine of the Thalweg is one of equality and justice. 'A river', in the words of Holmes, J. (New Jersey v. New York, 283 U.S. 336, 342, 75 L.Ed. 1104, 1105, 51 S.Ct. 478), 'is more than an amenity, it is a treasure.' If the dividing line were to be placed in the centre of the

> stream rather than in the centre of the channel, the whole track of navigation might be thrown within the territory of one state to the exclusion of the other."

In *Iowa* v. *Illinois,* supra, the Court stated:

> "When a navigable river constituted the boundary between two independent states, the line defining the point at which the jurisdiction of the two separates is well established to be the middle of the main channel of the stream. The interest of each state in the navigation of the river admits of no other line. The preservation by each of its equal right in the navigation of the stream is the subject of paramount interest. It is, therefore, laid down in all the recognized treatises on international law of modern times that the middle of the channel of the stream marks the true boundary between the adjoining states up to which each state will on its side exercise jurisdiction. . ."

This Court has also stated, in *Arkansas* v. *Tennessee,* 310 U.S. 563, 571, 60 S.Ct. 1026, 84 L.Ed. 1362, 1367:

> "The rule of the thalweg rests upon equitable considerations and is intended to safeguard to each state equality of access and right of navigation in the stream."

Thus, it is clearly shown that the rule of the thalweg has withstood the test of repeated efforts to change it to fit differing factual situations. As in the case with all rules of jurisdiction and property based upon justice and right, the rule of the thalweg has withstood the test of time.

Mississippi submits that the application of the rule of the thalweg by the Special Master as announced and fol-

lowed in all prior decisions of the Court to the undisputed facts of this case, should be determinative of this matter as it was in *Mississippi* v. *Louisiana,* supra.

(b) Where the course of a boundary stream changes through the operation of the gradual processes of erosion and accretion the boundary follows the stream and remains the varying center of the channel.

Missouri v. *Nebraska,* 196 U.S. 23, 25 S.Ct. 155, 49 L.Ed. 372, 374, enunciated the basis for the proposition stated above, as follows:

> "The former decisions of this court relating to boundary lines between states seem to make this case easy of solution.
>
> "In New Orleans v. United States, 10 Pet. 662, 717, 9 L.Ed. 573, 594, argued elaborately by eminent lawyers, Mr. Webster among the number, this Court said: 'The question is well settled at common law, that the person whose land is bounded by a stream of water, which changes its course gradually by alluvial formations, shall still hold by the same boundary, including the accumulated soil. No other rule can be applied on just principles. Every proprietor whose land is thus bounded is subject to loss by the same means which may add to his territory; and as he is without remedy for his loss, in this way, he cannot be held accountable for his gain.' It was added—what is pertinent to the present case—that 'this rule is no less just when applied to public than to private rights.' "

The classic definition of what constitutes accretion and erosion is found in the case of *County of St. Clair* v.

Lovingston, 90 U.S. 23 Wall. 46, 23 L.Ed. 59, where the Court held:

> "In the light of the authorities, alluvion may be defined as an addition to riparian land, generally and imperceptibly made by the water to which the land is contiguous. It is different from reliction, and is the opposite of avulsion. The test as to what is gradual and imperceptible in the sense of the rule is, that though the witnesses may see from time to time that progress has been made, they could not perceive it while the process was going on."

The operative words here are "see" and "perceive". Unless one can see and perceive changes in a river at the moment that they take place, then all such changes are by this definition accretive in nature and not avulsion. One can search from one end to the other of the voluminous record in this case, and one cannot find a shred of evidence that any of the changes which have taken place in this river could be seen and perceived while they were taking place other than following the Tarpley Neck Cutoff of 1935. Therefore, the migration westward of the river from 1823 to 1900 *circa* must be classified as accretion and erosion.

This Court has applied the visible and perceptible test in all cases where it has been applicable. Where additions to the banks of a stream are not visible while the eye rests upon the stream, this Court has held that the law of erosion and accretion applies. Some of the cases wherein the test has been applied are: *Missouri* v. *Nebraska,* supra; *Arkansas* v. *Tennessee,* supra; and *Oklahoma* v. *Texas,* 260 U.S. 606, 67 L.Ed. 428, 43 S.Ct. 221.

However, the same conclusion can be reached by stating the proposition in reverse, that there was no avulsion.

Accretion or alluvion "is the opposite of avulsion", *St. Clair* v. *Lovingston,* supra. In other words, if the change did not take place as the result of an avulsion, it must, *ex vi termini,* have taken place as a result of accretion and erosion.

Thus we see that the law recognizes no halfway house. If there was no avulsion in the area in controversy, as the same has been defined by the courts, then the changes have been the result of accretion and erosion. There will be no alternative than to adopt the Master's finding for Mississippi. Otherwise, principles of law which have been handed down over the centuries and which constitute rules of property will be radically changed.

(c) Definition of Avulsion

Avulsion is defined most succinctly in *Nebraska* v. *Iowa,* 143 U.S. 359, 361, 36 L.Ed. 186, 188:

> "It is equally well settled, that where a stream, which is a boundary, from any cause *suddenly abandons its old and seeks a new bed,* such change of channel works no changes of boundary; and that the boundary remains as it was, in the centre of the old channel although no water may be flowing therein. This sudden and rapid change of channel is termed, in the law, avulsion . . ." (Emphasis supplied)

Actually, the river is the state boundary. The thalweg merely marks the precise geographical location within the bed of the river where the boundary is to be fixed at any given time. The thalweg is an abstract legal concept only and not a concrete and living thing like a river. It is merely "the line at which the jurisdiction of the two separates . . . when a navigable *river constitutes the boundary . . .*", *Iowa* v. *Illinois,* supra.

As was stated in the opinion in *Nebraska* v. *Iowa,* supra:

> "But, on the other hand, if *deserting its original bed,* the river forces for itself a new channel in another direction, then the nation, through whose territory the river thus breaks its way, suffers injury by the loss of territory greater than the benefit of retaining the natural river boundary, and that boundary remains in the middle of the deserted river bed. For, in truth, just as a stone pillar constitutes a boundary, not because it is a stone, but because of the place in which it stands, so a river is made the limit of nations, not because it is running water bearing a certain geographical name, but because it is water flowing in a given channel, *and within given banks,* which are the real international boundary." (Emphasis supplied)

The above definitions, along with many others, make it clear that when the Courts speak of an avulsion, they are referring to changes involving the river seeking an entirely new *bed.*

This is manifest in the following quotation from Vattel, one of the fathers of International Law, which is contained in the opinion of the Supreme Court in *Nebraska* v. *Iowa,* supra, as follows:

> "But if, instead of a gradual and progressive change of its bed, the river, by an accident merely natural, turns entirely out of its course and runs into one of the two neighboring states, *the bed* which it has abandoned becomes thenceforward their boundary, and remains the property of the former owner of the river (Sec. 267), and the river itself is, as it were, annihilated in all that part, while it is reproduced in

its *new bed* and there belongs only to the State in which it flows." (Emphasis supplied)

A definitive summary of the rules regarding accretion and avulsion as applied by the Supreme Court is given in the case of *Arkansas* v. *Tennessee,* supra, as follows:

"It is settled beyond the possibility of dispute that where running streams are the boundaries between states, the same rule applies as between private proprietors; namely, that when the *bed and channel* are changed by the natural and gradual processes known as erosion and accretion, the boundary follows the varying course of the stream; while if the stream from any cause, natural or artificial, *suddenly leaves its old bed and forms a new one,* by the process known as an avulsion, the resulting change of channel works no change of boundary, which remains in the middle of the old channel, although no water may be flowing in it, and irrespective of subsequent changes in the new channel." (Emphasis supplied)

The opinion in *Oklahoma* v. *Texas,* supra, restates the above language quoted from *Arkansas* v. *Tennessee,* supra, and also defines what is meant by the "bed" of a river, as follows:

"When we speak of the bed, we include all of the area which is kept practically bare of vegetation by the wash of the waters of the river from year to year in their onward course, although parts of it are left dry for months at a time; . . ."

IV

EVIDENCE SUPPORTS THE POSITION OF MISSISSIPPI AND REFUTES THAT OF ARKANSAS

Contrary to Exception No. I in Arkansas' Brief, the testimony elicited through Austin B. Smith, Engineer and Potamologist; Dr. Charles R. Kolb, Geologist; Walter Guyer and J. S. McKnight, Foresters; J. C. Smith, eye witness to the events since 1930; and Captain H. C. Muirhead, veteran Pilot, leaves no room for question but that Luna Bar formed as pointbar accretions to Carter Point, Mississippi, and that the state line as depicted by Austin B. Smith is the correct boundary between Mississippi and Arkansas as fixed by the avulsion of 1935. The great mass of ancient maps, official governmental reports and natural phenomena irrefutably establishes the correctness of this position. Certainly it furnishes substantial evidence which would require an approval of the Master's finding. We will discuss briefly this testimony.

TESTIMONY OF AUSTIN B. SMITH

Smith, a registered professional engineer in Mississippi and Louisiana, spent his entire professional life since 1930 working exclusively with the Mississippi River and its tributaries (TR-359). His training and work encompassed on-the-ground soil borings for levee formations (TR-360), work in the field of hydraulic surveys, dredging, revetments, construction of pile dikes (TR-361), navigation and cutoff construction and design. During the critical period of the opening of Tarpley Neck Cutoff, he was actually concerned with the dredging during its construction (TR-362). In 1935, he transferred to the Mississippi River Commission and has served as Assistant to

the Chief of the Hydraulic Branch, Chief of the Dredging and Navigation Branch and then Chief of the Construction Branch. He served on the first Potamology Board which was created in 1942 (TR-363).

In addition to his work with the United States Engineers and the Mississippi River Commission, in his private practice he has been consultant on numerous water boundary problems of the Mississippi River and eight other rivers across the United States. His qualifications, including a list of his scientific papers and professional associations, appear on pages TR-365 through TR-368.

In addition to his broad general background and knowledge of the problems of the river, he has especially detailed and comprehensive knowledge of the regimen of the river in this particular area. He first became acquainted with the Carter Point area in 1935 and in 1954 made a study for Chicago Mill and Lumber Company to divide the respective accretion lands of Chicago Mill and Anderson-Tully Company at Carter Point. In 1963, he was employed by the State of Mississippi to determine the state boundary in Spanish Moss Bend in connection with criminal proceedings instituted by the State of Mississippi and subsequently studied the same area in connection with testimony given in the Federal District Court at Greenville, Mississippi in 1965 and in the Chicot Chancery Court proceedings at Lake Village, Arkansas in 1967, and finally for the preparation for giving his testimony and professional opinion in this case. His investigation into all available data was intensive and exhaustive (TR-382-383).

Smith divided his study into four time segments.

(1) 1821-1860 (TR-389 to 413)

He traced the history of the river, from the earliest official documentary evidence, the 1821 Young Survey of the Mississippi River, Exhibit P-3 (TR-389), through 1860. At all times the bend at Carter Point is shown as a rather tight meander and the conditions are such that you would expect erosion to continue in the bight or axis of this bend. There is no evidence of any detached bar or island formation around Carter Point Peninsula and there is a single undivided channel in that area. Normally, in the bight of the bend such as shown opposite Carter Point, there is gradual and progressive caving. This would be the normal situation in a bend such as that depicted on the 1821 Young Survey (TR-393).

Smith's Exhibit P-4 is a composite of the four township maps of Chicot County, Arkansas and Washington County, Mississippi and illustrates the river conditions in 1823-1830 (TR-394). These official GLO plats show that there was no divided flow of the river in 1823 and by the geometry of the river, you would expect caving along the right descending Arkansas bank in fractional Sections 9 and 16.

Smith then introduced and discussed a series of ancient maps which were contained in publications which gave directions for sailing the Mississippi River (TR-396-397). These publications are as follows:

The Western Pilot, 1825	Exhibit P-7
The Western Pilot, 1834	Exhibit P-8
The Western Pilot, 1841	Exhibit P-9
The Western Pilot, 1847	Exhibit P-10
James River Guide, 1856	Exhibit P-11

These maps depicted a river situation with accretions forming against Carter Point, with navigation holding hard against the Arkansas bank in Spanish Moss Bend and no evidence of a detached bar or island formation.

(2) 1860-1894 Period (TR-413-478)

Lloyd's 1863 map, Exhibit P-17 (TR-441) clearly shows the normal pointbar accretions being laid down against or at the distal end of Carter Point, the genesis of the formation that was later called Luna Bar, and such bar formation would be consistent with the normal regimen of the Mississippi River in a bend such as Spanish Moss Bend (TR-413).

The latest map prior to 1870 (Arkansas contending that an avulsion occurred in 1871) was McFarland's Map of portions of Desha and Chicot Counties of 1865, Exhibit P-19 (TR-415). McFarland was the agent of the Treasury Department, which was the agency responsible for the rehabilitation of the South following the Civil War. The Treasury Department had taken over the abandoned plantations and McFarland was its leasing agent (TR-416). There is no indication of a divided flow in Spanish Moss Bend, and Spanish Moss Bend and Carter Point have retained their essential configuration, indicating a typical pointbar building and caving bend situation.

More important to the solution of our problem, however, than the maps were the reports to Congress by General Humphreys dated June 11, 1866, and the subsequent Humphreys and Abbot's Report, dated February 20, 1869. By way of background, Congress passed the 1850 Swampland Act and the State of Arkansas, taking advantage of this donation of lands, constructed state levees along the Mississippi River during the period 1852-1860 (TR-399). During the Civil War and its subsequent turmoil, the old

state levees fell into a state of disrepair. General Humphreys was assigned the task of reporting on the condition of these levees. Humphreys' report verified that the Arkansas bank in Spanish Moss Bend had gradually caved over the years. This was what would normally be expected in a concave bend opposite a pointbar. The historical testimony of General Humphreys (TR-418, 420), speaking through his report to Congress, in part, is as follows:

> ". . . This alluvial district extending from Gaines Landing to the mouth of Red River, its area is 4,000 square miles. The levees of the narrow strip of alluvial land between Gaines Landing and the boundary line of Arkansas-Louisiana are in very bad condition. Some of the lengths of the breaks, nine in number, amount to six miles, mostly of high levee. The levee is besides much worn in many places. In the bend above Columbia the bank is caving badly." (This would be Spanish Moss Bend.)

The subsequent February 20, 1869 Report of Humphreys and Abbott to the 41st Congress, Exhibit P-134, brings this situation down to date as follows:

> "It is to be regretted that the report of recent survey, 1866 and 1867, made in Chicot County, Arkansas, under direction of the Levee Board of Louisiana to throw light on the problem is not at hand. In the winter of 1865-1866 these levees were in very bad condition. It is believed that they are even worse at present. There were then seven breaks between the Louisiana line and Columbia requiring about 380,000 cubic yards of embankment, costing about $156,000.00, and four breaks between Columbia and Gaines Landing would require about 350,000 cubic yards of embankment costing about $140,000.00. The levees still

standing were much worn in many places and the river is badly eroding its banks in the bend above Columbia." (TR-421).

Douglas' 1872 Map, Exhibit P-100, shows the bank line of 1872, the 1823 Arkansas meander line and the breached levees. Douglas depicts Luna Bar as being well to the east of the 1823 meander line close against the Mississippi shore. Douglas' survey of 1872, made long before this litigation had developed, completely confirms Austin Smith's opinion and the Master's finding that the Arkansas bank caved gradually and imperceptibly from 1823 to 1872 as the river migrated westward, and also confirms the on-the-ground examination of General Humphreys as detailed in his reports to Congress.

If Luna Bar had been formed by an avulsion, it would have been necessary for Luna Bar to be depicted by Douglas as being located between the 1823 meander line and 1872 top-bank and some remnant of the old state levee should have been visible on Luna Bar in some of the maps during the time period 1872 to the 1882 hydrographic survey. But none is shown.

When you compare the size of Luna Bar as depicted by Douglas in 1872, Exhibit P-100, and its size and location as depicted by Suter on his 1874 map, Exhibit P-25, the speciousness of Arkansas' contention becomes immediately evident. There simply was not enough area between the state levee described by General Humphreys and the 1872 bank line as surveyed by Douglas to permit the occurrence of the avulsion claimed by Arkansas. Compare Suter's map, Exhibit P-25, which shows a wide channel to the west of Luna with the sailing line hard against the Arkansas bank, with the 1882 hydrographic survey, Chart No. 39, Exhibit P-26.

Further, the remnant of the old 1872 state levee is still in place at Luna Landing, approximately 400 feet back from the Arkansas bank, and it is clearly discernible (TR-436). Arkansas' witness, Dr. Durham, agrees: "The position where the levees were breached in Douglas' time is in this area and still preserved. It is possible to walk these old levees . . ." (TR-992). These same levees are shown in the same identical geographical position on the 1882 Map of the Mississippi River Commission, Chart No. 39, Exhibit P-30, 1913 Survey (TR-440, 441).

The 1872 and 1874 reports made by Captain H. R. Richardson for the Louisiana Levee Commission and by Mr. Jack E. Sickels, civil engineer, deal with the levee system in Spanish Moss Bend. Both reports confirm the bank caving situation described by General Humphreys (TR-443, 444). On page 58 of Sickels' report, Sickels states that in the bend below Gaines Landing and above Luna "the banks are steadily caving", Exhibit P-27 (TR-445). Neither Richardson's report to the Levee Commission nor Sickels' report on the Mississippi River levees make any mention of such an unique or extraordinary natural phenomenon as an "outside avulsion" in this area. If such a thing had happened, it is incredible that some mention would not have been made in these two detailed reports which were directly concerned with the caving bank situation in Spanish Moss Bend and the integrity of the levee system. Sickels prepared a map to accompany his report, Exhibit P-28, and he agrees with Douglas and places Luna Bar well to the east of the line of levees, locating the west line of Luna Bar east of the 1823 Arkansas shore line, again furnishing irrefutable proof that Luna had its genesis as pointbar accretions, starting in 1863 with Lloyd's Map, Exhibit P-17, and subsequently being detached from Carter Point proper by over-bank scour. Lloyd's 1863 Map and

Sickels' 1874 Map both show the course of navigation to the north and west of these sandbar accretions (TR-449-450).

If there were ever any question about Luna Bar being pointbar accretions as opposed to Arkansas' contention that it is a remnant of the Arkansas high-bank, this question has been put to rest forever by the MRC Survey of 1882, Exhibit P-30. This survey was made by the Mississippi River Commission and it is a controlled survey and is the first trigonometric survey made of the Mississippi Valley. It is tied into longitude and latitude by a series of triangulation nets up and down the Valley. All subsequent MRC surveys and U. S. Engineer District surveys use this same trigonometric system of grids. This chart, as explained by the witness Smith, proves that when the River was at zero feet on the Arkansas City gage, dry land will connect Luna Bar to Carter Point. Even at 4 feet on the Arkansas City gage, that part of the bed of the river where the sounding was 6 feet or less would all be dry land. This was graphically portrayed by Smith on his Exhibit P-33 on which he took the base 1882 survey and contoured and colored all that part of the bed of the Mississippi River which would be dry land when the gage was zero at Arkansas City (TR-454-456). So we see that at the time of the first controlled survey showing the soundings of the Mississippi River, Luna Bar was firmly attached to Carter Point, Mississippi in 1882 and the thalweg or sailing line was to the west of Luna Bar close to the Arkansas shore.

The 1882 Chart, Exhibit P-30, further furnishes mute evidence of the origin of Luna Bar. Throughout its entire length and breadth, the legend "sand" appears. Its composition is identical with the sandbar, pointbar attached accretions to Carter Point shown on this same chart. It is completely devoid of timber and its topography is en-

tirely different from that of the Arkansas overbank, which consists of cultivated fields or timber.

The 1894 Hydrographic Survey, Exhibit P-34, also depicts Luna Bar as a dry sandbar with no vegetation. If the water level at the time of the survey had been three feet lower, Luna Bar would have been attached by dry land to Carter Point (TR-476). The thalweg and sailing channel is between Luna Bar and the Arkansas bank and the passing lights put out by the Coast Guard are along the Arkansas bank (TR-477-478). At bankfull stage in 1894, Luna Bar at reference range A-"A" would be 15 feet under water (TR-478).

(3) 1894-1935 Period (TR-476-497)

Exhibit P-36, the 1925 Hydrographic Survey, is the first indication of any vegetation on Luna Bar and it is indicated by the legend "willows and young willows" on the east side toward the lower half. With this exception, Luna Bar is a dry sandbar and the crest along reference point A-"A" is comparable to that of 1913 (TR-483) with the Bar standing in 15 feet of water at bankfull stage (TR-480).

Exhibit P-38 is the earliest aerial photograph showing Luna Bar and is dated 1930. It shows the small patch of willows on the extreme south end of Luna Bar as located in the 1925 survey, but the patch of willows is smaller than it was in 1925 and the remainder of the bar is patently a low, dry sandbar.

Between 1925 and 1933, the major floods of 1927 and 1929 occurred causing the erosion of a large portion of the east side of Luna Bar. Although the pointway channel between Luna Bar and Carter Point has widened considerably, the elevation of the bed has increased by approxi-

mately two feet at reference line A-"A". The 1927-29 floods caved approximately 1,500 feet off of the east side of Luna Bar, destroying the willows first shown on the 1925 Hydrographic Survey (TR-492). Exhibit P-39, the aerial mosaic of 1932, depicts two towboats, circled in red, running Spanish Moss Bend between the Arkansas bank and Luna Bar (TR-497).

(4) 1935-1972 (TR-497-503)

Exhibit P-42, the 1938 aerial mosaic, completes the graphic history as depicted by these maps and shows Tarpley Neck Cutoff as having been fully developed and filling is taking place in the upper arm of abandoned Spanish Moss Bend (TR-498). Navigation is now in Tarpley Neck Cutoff. The 1930 willow patch has caved into the River, but its former location is marked by a red circle in the bed of the now abandoned river.

These official maps furnish irrefutable proof of the gradual imperceptible growth to Carter Point by the process of accretion of the lands subsequently known as Luna Bar. From 1823-1930, the accretion formation had extended the distal end of Carter Point as shown by Lloyd's 1863 Map, Exhibit P-17, and by Douglas' 1872 Map, Exhibit P-24, and the river had migrated and eroded the Arkansas bank westward in Section 9 with a corresponding building of Carter Point westward. During this period the sailing line is close along the Arkansas bank as shown by the river maps, the soundings and the navigation lights. Between 1872 and 1882, Luna Bar has built downstream slightly and to the west.

From his study of these historical documents and maps, the Potamologist Smith concluded:

> "Luna Bar, as we have pointed out, had its genesis about 1863 along the distal and north side, the distal end and north side of Carter Point, which is shown on Lloyd's Map, and is subsequently enlarged westward and built downstream a small amount, but in this process the navigation course and the thalweg of the river has always been between Luna Bar and the Arkansas Bank . . . it (Mississippi River) caved it (Arkansas bank) back from the 1823 bankline, as shown by the 1823 meander line on the GLO plats, and the midpoint of Section 9, it caved it back an ultimate distance of about 3,600 or 3,700 feet, that is, the maximum bankline." (TR-466-467)

The Special Master correctly concurred.

These maps, modern and ancient, the on-the-ground conditions, the quality of the soil and the variation in elevation of Carter Point-Luna Bar accretions, all amply and conclusively support the finding of the Special Master that Luna Bar had its genesis as pointbar accretions to Carter Point, Mississippi.

V

RESPONSE TO POINT II OF ARKANSAS' BRIEF, THE PHYSICAL FACTS ASSOCIATED WITH LUNA BAR CONFIRM THE MASTER'S FINDING

We submit that this case could and should be decided entirely upon the testimony afforded by the ancient and accurate maps and surveys which were introduced and commented on above, together with the reports made by General Humphreys, Engineer Richardson and Engineer Sickels in their study of levee conditions in Spanish Moss Bend in the time span 1866-1874. However, the timber stand on Luna Bar completely substantiates the Master's

finding and should be noted. In the case of *Ussery* v. *Anderson-Tully Company,* 122 F.Supp. 115, 121, the court had this to say:

> "Accurate maps and charts are, of course, indispensable in cases like the instant one, since in most of such cases the crucial movements of the river have not been observed by living witnesses. If all of the maps of the Arkansas River were accurate in detail, and if the chronology of such maps were complete and close, solution of problems of this kind might be fairly simple in this area. Such, however, is not the case.[1] What maps are available are far apart in point of time, and some of them are meager in detail. The official maps prepared by the Corps of Engineers or by the Mississippi River Commission, however, are accurate maps, and their depictions are prima facie correct. Crow v. Johnston, 209 Ark. 1053, 1059-1060, 194 S.W. 2d 193.
>
> "It is obvious that physical evidence on the ground is of the utmost importance in the determination of these cases; ordinarily, if the theory of one expert as to the nature and origin of the area in controversy is correct, it will find corroboration on the ground in the presence or absence of a lake, a meander scar, recognizable old bank lines, or other topographical features; on the other hand, a theory which is not supported by physical evidence is subject to grave doubt as to its correctness, regardless of the eminence of the potamologist who may propound it. Where, as here, the primary question is the determination of which

1. Considering the passage of time, it is remarkable that so much documentary evidence was available. Exhibits P-4 through P-29 show that the longest time span in which there is no recorded, documented proof of the geographical conditions in this area was the six-year period 1841-1847.

of two former river banks was the source of origin of the area in controversy, it becomes most important to consider the species and distribution of the timber throughout the area. This is true because timber does not spring up haphazard on newly formed lands, but follows a rather definite pattern of appearance, growth, maturity, death, and succession. The *types of trees* which first appear and establish themselves are known as 'primary species'; those which follow are referred to as 'secondary species'; and these, in turn, are followed by the 'climax species' which will make up the *permanent forest* on the land as long as the climate remains unchanged.

"When accretions are formed in the alluvial river bottoms in the lower Mississippi Valley, they are at first simply mud and devoid of vegetation. As time goes on, however vegetation appears thereon and in time trees are established. The first species to occur are willow and cottonwood, which are tolerant of water, and which receive in such locations supplies of sunlight adequate to their needs; while willow and cottonwood are tolerant of water, they are intolerant of shade and will not establish successive stands in the same location. As the willow and cottonwood grow to maturity, the secondary species, such as sycamore, elm, hackberry, ash, pecan, and other types, which are more tolerant of shade, spring up beneath the willow and cottonwood, and as the latter disappear, the secondary species take over, to in turn, give way to the climax species, usually, oak, hickory, or gum, the seedlings of which grow readily in the shade of their parent trees.

"The length of time that it will take for this succession of *timber types* on newly formed lands to progress

from the *primary to the climax type of forest* is obviously subject to considerable variation depending upon a number of factors, and it should always be kept in mind that the pattern is subject to some variation. It may be safely said, however, that *once a forest* is established on an alluvial deposit, it will proceed toward, and eventually reach, a climax in types and its progress in that direction can be observed by the trained forester and in certain cases even by the layman. The application of this principle to accretion cases can be summed up in the statement, 'The timber follows the accretion'; that is to say, the land first formed is covered by the more advanced *types of timber,* and if the direction of the progression of the *timber types* can be ascertained, the relative ages of the various portions of the area can be logically inferred. In view of the importance to be attached to the *forestation* of the area in controversy in certain cases, it is clear in such cases the testimony of experienced foresters and dendrologists ranks in importance with that of engineers and surveyors." (Emphasis supplied)[2]

W. H. Guyer, a forester of much experience and training, had knowledge of the area as far back as 1940 (TR-38, 59), at which time there was some young willow on Luna Bar. In the early 50's, he conducted logging operations on Carter Point and at that time observed young willow and cottonwood under log size on Luna (TR-61). In the early 60's, he made a timber cruise on Luna Bar and

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2. We have italicized the references to "types" and "forests" because of the importance of distinguishing between individual trees which can appear in isolation or in clumps as against the stand or forest which consists of individual trees. Frequently, these individual *trees* can be found scattered through a *forest* of a different succession.

Carter Point and prepared a cruise map which appears as Exhibit P-54. In 1965, he ran certain survey lines on the Arkansas bank and also on Luna Bar, which he depicts on his map, Exhibit P-51 (TR-79-80).

From his examination of the timber growth and from his experience as a forester, he found the principal timber on Luna Bar to be of the primary stage, with some secondary and a few trees in the climax species. He testified that in the emergence of timber on alluvial soils there is a definite pattern (as discussed by Judge Ussery, supra).

After vegetation becomes established, the life of the forest consists of three successive stages, but it is difficult to tell when one stage is completed and when another stage commences. These three stages are primary, secondary and climax. The willow and cottonwood are the primary type. Soft elm, sycamore, hackberry, box elder and several other types are generally included in the secondary species with generally oak, gum, elm and others comprising the climax species (TR-101).

In conclusion, Guyer found the vegetation on Luna Bar to be of a primary type of willow and cottonwood. No trees were found to be over 36 years of age and only a few had reached that age. The general age was between 20 and 30 years. From his experience on the river and as a forester, it was his opinion that it took Luna Bar approximately 40 years to reach a stage where it was susceptible of sustaining a growth of trees (TR-108).

Similarly, Mr. J. S. McKnight, an outstanding authority on timber in the Mississippi Alluvial Valley, corroborated Guyer's testimony as to the age and type of timber on Luna Bar. Mr. McKnight used an increment borer to determine the ages of the larger and apparently older trees. The oldest tree that he found was a cotton-

wood 37 years of age (TR-142). Without going into detail, Mr. McKnight testified to the same succession of species as did Mr. Guyer. Arkansas is not entirely correct in stating that McKnight did not go upon the high area of the island, but only went on the "south end of Luna Bar and the eastern side, but did not go on the high area, the north or west side."

He followed Guyer's reference line A-"A", Exhibit P-54, "from the Arkansas River levee to the high bank of Carter Point in Mississippi" (TR-115) and he "viewed the forest on each side of the line and also walked and observed other places on this particular point." (TR-116). Reference to Exhibit P-54 shows the line completely crossing the bar and going over the high part, which McKnight describes as "a hump of sand, covered with sandbars and bermuda grass and came into another stand of timber on the other side of this hump going east." (TR-118).

From Point C, Exhibit P-54, "practically in the center of Luna Bar, and from there I proceeded north along a line" crossing and re-crossing a road observing the timber (TR-120). He bored a cottonwood near the center of Luna and determined its age as 36 years (TR-121). This testimony refers to his first examination of Luna.

McKnight made a second examination of Luna "to look more closely at the south and east edge in the center of Luna Bar" (TR-141) at which time he aged a cottonwood tree relied upon by Arkansas' witness Thompson and found its age to be 37 years (TR-142). Stumps of cypress trees along the Arkansas side of the relic of old Spanish Moss Bend, west of Luna Bar, which he saw on his first trip (TR-92), he more exactly located on aerial photographs (TR-144).

The second trip was quite comprehensive:

"Q. On your second trip to the island, did you (490) go over any other parts of the island? On your second trip? Travel over any other areas? (Handing witness Plaintiff's Exhibit P-51). A. I think that I will need to point out the area that I walked over—(Pointing to said Exhibit P-51)—I walked over this area all through here and proceeding on through here to this high bank—(interrupted)

"Q. Excuse me, Mr. McKnight, the record won't be able to see that—you are now pointing to the reference line on your Exhibit Number P-51, or the survey line, will you state the points on the exhibit? A. From Point A to Point C. Right here. And, we returned to C and proceeded from C to F. And, I made another trip with Mr. Guyer and walked in from a point on Pointway Channel, that would be a little below the reference line of the South reference line and proceeded in this fashion, which is—since the record will not show the map itself—to the east side of Luna Bar all the way to an intersection of the original reference line C to F, to a point where it met Spanish Moss Bend on the north of Luna Bar. And, then proceeded down the west bank (491) of Luna Bar to a little strip of sapling size Sycamore and into the edge of the sand area and on around the edge of Luna Bar to the Southwest and to the South and out to the point of Luna Bar where I left Luna Bar. Now, that was the additional trip to Luna Bar.

"Q. Did you circle the edge of the island? A. Not the exact edge, but about an eighth or a quarter from the edge—an area of possibly a quarter. Of a mile."

So when Arkansas lifts out of context McKnight's statement:

> "Now, I only went on the south end of Luna Bar and the eastern side. I did not go on the high area the north or west side."

it is obvious that McKnight is simply saying that on the *second* trip he did "not go on the high area the north or west side" (TR-148) having covered this area on his first visit as testified to above.

Nor is there any real contradiction by the foresters introduced by Arkansas. Mr. John Putnam, forester for Arkansas, testified on cross-examination that technically, a type of forest is a typical association of species (TR-570), which is found competitively in the woods. When you speak of a young or an old forest, you are talking about the preponderance of trees, since a forest is a community and judged as a whole. When the pioneer species of cottonwood and willow comprise the over-story of a forest and the secondary species are coming up as an under-story, the forest nevertheless, would be classified as a primary species as long as the forest over-story of primary species hasn't been broken (TR-571). Willow and cottonwood are the first to arrive on alluvial land, since they both must have mineral, soil and full sunlight and moisture at the time the seeds hit the ground (TR-577). He is very familiar with the typical pointbar formation where alluvium has been deposited by the river against (TR-578) the distal end of a point. The pointbar develops as sand or silty sand and then as succeeding rises in the river occur, fine silt and other material is deposited on the sand. This phenomenon takes a period of years to occur, and although it is very rapid geologically, this phenomenon would take something like 15 to 20 years up for the sandy

soil to convert to silt or other material, which would be capable of sustaining vegetation. The cottonwood and willow are the first type of trees that become associated with the pointbar formation (TR-579). Cottonwood, in some situations, will start almost simultaneously with willow, although it comes in generally fairly soon after the willow is underway and will grow up through the willow if the willow is on a favorable cottonwood site (TR-582). Under favorable conditions, the cottonwood will grow six to eight, maybe ten feet, in the first year and once established, the average growth in height per year is five, six or seven feet. Thus a 50-foot tall cottonwood is a relatively young tree (TR-583).

Putnam admitted that it is axiomatic in connection with the growth of a forest on a pointbar composed of alluvium, that, even though you have a predominant willow and cottonwood forest starting at the same time, you will get the secondary species starting in simultaneously as an under-story. The secondary and primary species are all mixed together into a hodge-podge of different trees (TR-585). It is not uncommon for the secondary species and even the climax species to come in scattered and isolated simultaneously with the willow and cottonwood. On an alluvial pointbar formation where cottonwood and willow are predominant and cottonwood and willow are partway along in their development, one would expect to see trees of the secondary and climax succession (TR-587). From his inspection of the area, the only thing that he found on the ground which would indicate any timber growth over 44 years was the cottonwood around the rim of the sandy plateau, which he believed went back to the 1927 flood and would probably be 44 years old (TR-604). On the trailing ridge to the south, he believes most of the trees are 30 to 40 years old (TR-607).

The majority of the trees on Luna are approximately 35 to 40 years old (TR-626). This corroborates exactly the evidence as to tree origination and growth as conclusively proven by the 1913 Hydrographic Survey, Exhibit P-35, the 1925 Hydrograph, Exhibit P-36, showing for the first time "willows and young willows" on Luna Bar, the 1930 Aerial Photo, Exhibit P-38, showing a small patch of willows on the extreme south end, and the 1938 aerial mosaic, Exhibit P-42, which shows the 1925-1930 willow patch eroded away with a new stand just coming into being.

On pages 7 to 11 of his Report, the Special Master reviewed the testimony as to the forest and its individual trees and concluded, as did Judge Clayton in *Anderson-Tully Company* v. *Walls*, 266 F.Supp. 804 (N.D. Miss. 1967) that:

> "[I]n sum, the weight of the evidence as to vegetation is that the bar is overwhelmingly composed of the pioneer species, but with scattered isolated trees of the secondary group, and on occasion—a young tree of the climax species." 266 F.Supp. at 810.

VI

GEOLOGY OF LUNA BAR SUPPORTS THE MASTER'S FINDINGS

In Point III of its exceptions Arkansas asserts that "The geology of Luna Bar completely negates the theory of the State of Mississippi and the Report of the Honorable Clifford O'Sullivan that the Island is the product of a pointbar migration." Far from negating the findings of the Special Master, the evidence submitted by Mississippi's expert geologist, Dr. Charles R. Kolb, proves the genesis of Luna Bar as pointbar accretions to Carter

Point, Mississippi, while the testimony given by Arkansas' experts, Dr. Clarence O. Durham and Spillers fail to so much as raise an issue of fact on this point. Durham and Spillers "theorize" that Luna was created as an "island" by the avulsive action of the river and this was accomplished, Durham asserts, by "[a]n abrupt shift in the western bank line of the western channel in a one-year interval. In association with this, the island came into being" (TR-989). To accommodate this theory it was necessary to "[a]ssume that the high waters scoured out the channel there which had been abandoned on the western side", but Durham conceded it had been impossible to establish such a flood, nor could he find any evidence of such an "abandoned channel" (TR-1033-1034). The Special Master failed to find any evidence in the record of an 1872 flood or an abandoned channel (M.R.-27, 32). We have found none in the record, nor has Arkansas assisted us by pointing out where in the transcript this missing evidence can be found. So, Arkansas' theory remains an assumption without proof to sustain it.

The testimony of Dr. Kolb proves that Luna Bar had its genesis as the result of the normal action of a meandering river. Dr. Kolb, who is Chief of the Geology Branch of the Waterways Experiment Station, U. S. Corps of Engineers, and whose qualifications are impressive (TR-255-264) testified:

> "I concluded that Luna Bar was a Point Bar deposit, which had accreted to the growing bend that was part of Carter Point, and it was bounded on the west by Spanish Moss Bend; that this was all part of the same Point Bar formation, formed by gradual accretion to a growing bend." (TR-265).

All of the geologists who testified are in agreement that the Mississippi is a meandering alluvial stream

coursing through an alluvial flood plane. It is one of the facts of life about the Mississippi River that it writhes through its valley like a snake. This phenomenon was described by Dr. Kolb as follows:

> "Meandering means that the river has a sinuous pattern, an 'S' shaped pattern. I don't believe there is any alluvial stream truly straight. A stream such as the Mississippi and many other alluvial streams, if you straighten it, will begin to develop a sinuous pattern in very short order. It will begin to cut at one bank and to fill at the point opposite that bank."

These bends are connected with a straight stretch of river called a "reach" and the thalweg or deepest part of a stream normally is against the concave bank, becomes shallow in the reach and deepens again against the next concave bank downstream. The "thalweg always hugs the concave bank" (TR-271).

> "During normal or ordinary flows, the thread of maximum surface velocity stays on the concave or outside portion of the bend; that as the river goes into higher stages, particularly flood and over-bank flows, at the time when avulsions occur, the thread of maximum surface velocity shifts from the concave bank toward the convex Point bar side of the river." (TR-373).

Dr. Kolb then described the "scouring" effect of the river, caving out material from the concave bank and carrying it downstream to be deposited against a pointbar downstream, thus building the bar out by the process of accretion (TR-276).

> "The scour pool, the word I have just used, is usually hard against the bottom, the base of this concave bank. When the river begins to rise, as the

river goes up, this level goes up, this scour pool begins to scour deeper, and the bottom of the river goes down at those bends. Tremendous quantities of material are carried out of this area down stream. There is also carried from this concave bank, as it erodes, particularly during these flood flow, and as it erodes, this material is also carried down stream. It is this material that goes down stream, and builds or accretes to the Point Bar areas." (TR-275).

Kolb used his Exhibit P-81 to show how a detached pointbar, such as Luna Bar, is formed (TR-285). His testimony in this regard is as follows:

"P-81. This shows what I think and what others think is the reason for the formation of a detached bar such as Luna Bar. I might point out that many, many such features occur along the river. Almost every third bend in the Mississippi River has some sort of bar develop and many of them have detached bars such as you see here. The reason for their being is reasonably simple, I believe, in that it comes back to this point that maximum surface velocities stay within or next to the concave bank during low water normal flows. During flood flows, particularly overbank flood flows, there is a tendency for these maximum surface velocities to shift toward that convex bank, and if a particular swale or low is continuous, such as you see here, all of the way across the bar, it is quite easy for that particular swale to be scoured by the flood flow and for a portion of that bar to become detached, as we see there. So you end up with a channel between that detached Point Bar, called a Pointway, and the area which still contains the thalweg, the portion which contains the thalweg and sailing line, which is called the bendway. Once

this happens this can seal itself off in the next flood or, depending on the vagaries of the currents that come down through this area, the shape of the bends upstream, et cetera, et cetera, this Pointway can enlarge, and the detached bar itself can move out toward the central part of the river. As I say, these are not uncommon, these are merely parts of the normal migration, if you will, of a bend."

VII

ARKANSAS' POINT IV IS ESSENTIALLY A RESTATEMENT OF ITS POINT III DEALING WITH THE GEOLOGY OF LUNA BAR

Mississippi feels that she has adequately responded to this position as shown immediately above. Much of the geological data referred to by Arkansas was either compiled under the direction of Dr. Kolb or he participated in it. It would unduly lengthen this Brief to discuss these geological reports and studies in detail, but suffice it to say, Dr. Kolb thoroughly explained them in his testimony. In our opinion, the analysis of the proof introduced by the various geologists as made by the Special Master on Pages 25 through 33 of his Report, could not be improved upon and we would simply adopt it as our response to this position of Arkansas. As the Master pointed out, no cross-examination of Dr. Kolb was attempted and the theory of Mr. Spillers and Dr. Durham was based upon assumption piled upon assumption with no probative testimony to support the assumptions or the theory.

VIII

COMMENT ON THE PRIOR COURT DECISIONS

Mississippi is a little uncertain of the position of Arkansas under Point V of her Brief. Nowhere in the finding of the Special Master is there any indication that he felt himself "bound" by these decisions, nor is there any indication that he was "influenced" by them. It is true that he made reference to the litigation and simply agreed with the Chancellor of Chicot County, Arkansas and the District Judge of the United States District Court for the Northern District of Mississippi, both of whom had previously sustained the position of Mississippi.

We agree with *Durfee* v. *Duke*, 375 U.S. 106, 11 L.Ed.2d 186, 84 S.Ct. 242, cited by Arkansas, which held in essence that litigation between private landowners in either state or federal courts might determine individual property rights of the litigants where a stateline was the boundary, provided that such private litigation was prosecuted to a final unappealable decree. *Durfee* simply says correctly that this private litigation has nothing to do with the ultimate authority of this Court to make the final decision of where the stateline is. That is the position Arkansas and Mississippi find themselves in here.

CONCLUSION

Mississippi submits that the evidence submitted on her behalf was not merely substantial but was overwhelming and establishes conclusively that the state boundary is that recommended by the Special Master. We

respectfully request this Court to adopt and confirm the Report of the Special Master.

Respectfully submitted,

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I, Mitchell Emmett Ward, do hereby certify that a copy of the foregoing Response of the State of Mississippi was served upon the Honorable Jim Guy Tucker, Attorney General of the State of Arkansas, at his usual post office address in Little Rock, Arkansas, and upon the Honorable William H. Drew, Special Counsel to the Attorney General for the State of Arkansas, at his usual post office address at Lake Village, Arkansas, by mailing U. S. mail, postage prepaid, on this the 14th day of June, 1973.

MITCHELL EMMETT WARD