

TRANSCRIPT OF DIANE SORAN'S REMARKS AT MEETING OF  
SHROUD OF TURIN RESEARCH PROJECT MEMBERS AT ESPAÑOLA, NEW MEXICO

APRIL 28, 1979

(Introduction is marred by recorder noise.)

Diane Soran:

...to the research he's done. I'd like to review three aspects of that manufacture with you, because two of those aspects are pertinent (noise).

To begin with, the warp threads, when the loom was strung, were covered with a starch solution. This was done to stiffen them. Ray feels it was probably a weak starch. But it's fairly logical. You stiffen the warp threads ...

Ray Rogers:

Walter McCrone said about finding starch grains on the Shroud from our tape samples. Fits right in with that.

Diane Soran:

You would stiffen the warp threads, then, to facilitate the weaving process. The second step after weaving would be a bleaching step, probably with a plant-ash, probably a sodium or potassium carbonate solution. And then finally, to get rid of this stiff feeling in the cloth, you would wash it. And you would wash it with a soapy, frothy solution. Now, Ray has found some indication in the historical literature that this soapy solution was made from the roots of a particular tree native to the area, and the name of that tree happens to be Saponaria officinalis.

The roots of the Saponaria officinalis tree...the soap tree...cause this characteristic soaping in water, when it's agitating. What's actually happening is a chemical compound, known in general as the saponin glycoside, is being leached out of the root and now is in the water solution. And that's what's causing the frothing, or the soaping, of the water.

My premise is that, since this soaping, washing stage was the last stage in the process, you have left saponin glycoside on the cloth itself. And that's the crux of the problem. Now, what are the chemical characteristics of the saponin glycoside, and how does this coincide with image formation?

I have no intention of addressing Resurrection or the life source or what the energy was. All I am going to say is this: Given a burst of energy, Larry and I have worked with the CO<sub>2</sub> laser over at M1, and we will do more work on that. But, given a burst of energy--whatever it may be--what happens and what the image is formed by, a hydrolysis of the saponin glycoside. Now, this is reasonable to believe, because we have hydrolyzed saponin glycoside. Simply heating a saponin glycoside solution brings about hydrolysis. A glycoside--if I may digress for just a second--is sort of an ether, if you will. What it is, you've got an alcohol and you've got a sugar molecule, and you condense the two molecules. You split out water of condensation, so basically you've got an ether that you're dealing with.

Now, this is easily hydrolyzed, which means you simply can add this water back to the molecule and separate the sugar from the saponin half, or the aglycone half, as we call it. So hydrolyzation to separate the two, or condensation, are certain reasonable chemical processes. Okay, back to the Shroud.

The Shroud is placed on the body, after it's been taken off the Cross, if you will, and the Shroud then comes in contact with the blood spots on the body. Now, a saponin glycoside is a hemolytic. What do I mean by hemolytic? I mean when the wet blood strikes the saponin glycoside on the cloth, it causes hydrolysis of the saponin glycoside in the area of contact, because the blood is wet, if you will. So, you're hydrolyzing the compound. You are then left with the saponin half of the molecule, the aglycone half of the molecule, and the sugar. The aglycone half of the molecule is a hemolytic. By that I mean it bursts the red blood cells.

What a hemolytic does is, by osmotic pressure, more water goes into the red blood cell, and it bursts; the cell membrane bursts. This fixes the hemoglobin, and this is your blood-red color. So this is, I believe, the first chemical reaction that has taken place after the Shroud has touched the body.

Now, we have got some samples that Larry and I have done--did we ever get the microscope?

Ron London:

Yes. I don't know how good it's going to be, though, because we haven't... it's strictly a transmission, not a reflection. We might make it work.

Diane Soran:

What we've got here is a piece of linen that Ray was kind enough to get, I don't know from where.

Ray Rogers:

We've got to send a note to some of the people who have helped us out, sometime, on Shroud stationery. This is one of the...a little lady in the middle of Oklahoma had some linen that she had put away, like 50 years ago, and it was uncut and it's not been used for anything, and it's not been washed in all that time. She gave me the whole thing, about a third of a bolt, almost, of this linen.

Diane Soran:

The point is, it hasn't been treated with brighteners and all these modern chlorine bleaches, all these really nifty things. So it's as close to the real thing as we can get our hands on right now.

Now, we've dropped blood samples, and the way I ran the tests were as follows: One piece of linen is covered with already hydrolyzed saponin glycoside; in other words, I took the saponin glycoside solution and I heated it. Then I put the cloth in. So it's already been hydrolyzed; I've already split that molecule. And you'll notice it's an excellent hemolytic. The blood is still very blood-red, if you want to pass that around.

This is a sample of a cold saponin glycoside solution. In other words, now the hydrolysis has to take place on the cloth itself. It didn't take place in the beaker. On here went a saponin glycoside, non-hydrolyzed. If hemolysis has taken place, you had to have hydrolysis first, and I have a reference to that.

Believe it or not, it comes from Hebrew University in Jerusalem. So, hydrolysis took place, then, on this cloth, and then hemolysis took place. And you can see the blood-red color is still fixed. Eric scraped some of my blood off, but the stain is still very obvious.

Eric Jumper:

Is this still red? This first one? But this didn't have the hemolysis taking place on the ...?

Diane Soran:

Yes, it is. This had already-hydrolyzed saponin glycoside there.

Eric Jumper:

Now, how did you get ... you heated the thing after you put the blood on it?

Diane Soran:

No, you see, you don't have to heat it. You just need to wet. The hydrolysis reaction simply means the addition of water to a molecule. That's what hydrolysis means.

Eric Jumper:

And that fixed it.

Diane Soran:

If you add water to the molecule, you can cause hydrolysis, and then subsequent to that you have the hemolyzed blood reaction taking place. My point, in doing this in two separate ways, was to show (1) yes, when it's hydrolyzed, it can take place, because that coincides with the literature, but (2) could the hydrolysis take place on the cloth itself and fix the blood? The answer is yes, as you will see.

Eric Jumper:

I have seen...this looks to be exactly the same color.

Diane Soran:

All the "A" samples ...

Ray Rogers:

Remember, that was one of the things that was really worrying us: If it was real blood, how could it be red? It couldn't be red if it was real blood. It can be red.

John Jackson:

One question: You're saying that the first one you hemolyzed before you put it on the cloth ...

Diane Soran:

Hydrolyzed.

John Jackson:

Hydrolyzed, I'm sorry, before you put it on the cloth; the second one, the cloth did it...?

Diane Soran:

The cloth didn't do it; it happened on the cloth.

John Jackson:

But the cloth was treated with these Saponaria?

Diane Soran: Yes.

Ray Rogers:

If the cloth has been washed with the Saponaria, it will hemolyze blood right on the dry cloth. That's what she has proved.

John Jackson:

Okay. Then, of course, if you don't do that ...

Question:

Is it the ( ? ) blood that gives you the water...?

Diane Soran:

That gives you the water, in order to hydrolyze the saponin glycoside. And then, subsequent to that ...

Question:

I didn't know whether you were relying on the humidity of Los Alamos ...

Diane Soran:

Just wet blood.

Ron London:

What percent of the blood is straight water? It's a big percentage.

Diane Soran:

I can't answer that, but it is a big percentage.

Ron London:

It's like, what, 70 percent, something like that?

Ray Rogers:

Much more than that, like 98 percent.

Eric Jumper:

What about if you take a blood clot, which is already clotted and looks somewhat brown, say a day or so after, and then took a cloth which was damp, but treated with this Saponaria, and put it over a clot. Would it make a red stain?

Diane Soran:

We have had no one willing to give us a clot, yet. No one's willing to bleed that much. The point is, we just haven't done that. That's something we will do. Then I want to fire it with...I keep pointing to Larry, because then I want to hit it with the laser. No, we have not done that.

I can also show you samples here. These samples are approximately two and a half, maybe three, weeks old. Again, this is hydrolyzed blood. Now, disregard these two; we zapped them with the laser, and a little too much pounce to the ounce there. But in the center, you can see some blood spots still, and they are still red. This is two and a half weeks old. This I'd like to say on both of these: This is already hydrolyzed saponin glycoside. I would like to remind you that the unlettered sample is already hydrolyzed saponin glycoside, and every time you see an "A" after it, there was unhydrolyzed on there.

Question:

How did you put it on the cloth?

Diane Soran:

Just, I would expect, as they would have done it in ancient times. I just dumped the cloth in, that's all. Just let it wash, sloshed it around. I soaked this one for maybe 20 minutes, half an hour, while I was doing something else. And the hydrolyzed one I simply heated on a hotplate, in order to cause the hydrolysis first, and then soaked the cloth in it.

Eric Jumper:

Ray, look at the one that I've scraped off the surface, blood.

Ray Rogers:

If we just had a little bit more light. If we went out here and stood on the ... had this looking at the window...

Diane Soran:

I apologize for not being better prepared, in terms of the microscope.

To reiterate, then, the premise is, you've got this cold saponin glycoside on there. I just believe it's cold because it would ease the process, that's all. I mean, you're working with 14 feet of cloth. If you can wash the starch out without heating it, that's probably the way you did it. And that would be the easiest way to do it, and that's the only reason I'm saying that.

The cloth covered with cold saponin glycoside hits the blood clot, hydrolysis takes place on the cloth itself, followed by hemolysis. You now fix the blood stain. There's the blood.

Question:

The hemolysis fixes the red, pinkish color ...?

Diane Soran:

Right, the hemoglobin. It bursts the cell and fixes the hemoglobin as that red color.

Bob Dinegar:

Now the word "fix" is used here; and Ray and I had a big discussion about that last night. What do you mean by "fix?"

Diane Soran:

Remain unchanged.

Bob Dinegar:

That's right. In other words, the hemoglobin itself is red, and if you don't hemolyze it, you don't see the red, because the cell structure becomes opaque. Is that correct?

Diane Soran:

I haven't delved into it that far. But your first statement is completely correct.

Bob Dinegar:

Okay. That's the way I was told, that the fixing of the red color means that the membrane around the hemoglobin is removed, and so therefore the red color stays there all the time. In other words, a brown sample of blood--if you could remove the cell--would look red.

Joe Accetta:

That's what I was going to ask. The distinction between brown blood, that we're all familiar with, and red ...

Bob Dinegar:

And, according to the way I understood Ray last night, when we were discussing it, is that it is the cell membrane of the non-hemolyzed blood which causes the brown, non-red color.

Ron London:

I don't think you have to remove the whole membrane of any kind (or, at any time ?), but it's fractured.

Bob Dinegar:

You're right. Actually it is the drying out and, if there's water in the cell, it spreads it enough so that you can look through and the drying-out doesn't bust the cell and ... The process is a lot more complicated than I ...

Diane Soran:

Basically, what's happening is the water is flowing into the cell such that you are bursting the cell. It can't hold any more. It's expanding against the cell membrane. That's what hemolysis means. And it's bursting. It's the osmotic pressure. That's exactly what's doing it. And now you're left with ...

Ray Rogers:

There's also, supposedly, an enzyme in there that decrepitates the cell wall, I believe, where in the blood it is activated, I think, by this hemolytic agent. There are two things that happen, and I don't know which is more important.

Diane Soran:

This reference I mentioned before ...

Ray Rogers:

The thing that happens is, it sure ruptures the cell wall and ( ? ) out.

Bob Dinegar:

Some of the references are that the sapogins will actually...saponins... will actually attack the cell wall and react with the ( ? ) on the proteins.

Ray Rogers:

There's some stuff about ( ? ) saponin and the way it attaches to the cell wall and what it does to the permeability of the wall, the strength of it, and all this. It's a very complicated.

Bob Dinegar:

But it's supposed to weaken it.

Ray Rogers:

But what it does is, just like you said, it ruptures the cell wall and out comes the hemoglobin.

Bob Dinegar:

We don't really care about how it ruptures it ...

Diane Soran:

That's my point; it ruptures it and it fixes the hemoglobin...

Bob Dinegar:

But, see, the interesting point is, or the confusing point to me, is the word "fixing" the blood. You see, it really doesn't fix anything, as far as the blood is concerned.

Comment:

"Fixing" is a misnomer, because ...

Bob Dinegar:

That's what I mean.

Diane Soran:

Maybe that's a poor choice of words ...

Bob Dinegar:

That's the word, Diane; I'm not criticizing you. I mean, that's what they say, but ...

Don Janney:

But to us as chemical laymen, we think of "fix" as in a photographic process, or ...

(Mixed comments.)

Joe Accetta:

... preclude any further action from taking place.

Diane Soran:

That's exactly what it is.

Bob Dinegar:

What you're doing is just let the hemoglobin be its normal color; you haven't touched the hemoglobin, actually ...

Comment:

Let you see the hemoglobin ...

Diane Soran:

Before you can have hemolysis, you must have hydrolysis, and that was why it was so important to show that, on cloth treated with unhydrolyzed saponin glycoside, you could cause the hemolysis reaction to take place. That's why we did that, because in order to cause hemolysis, you must first hydrolyze it. You must first get rid of that sugar, separate that sugar off, and be left with the aglycone part of the molecule. And that's what's causing the hemolysis effect, is the aglycone part of the molecule.

By aglycone, now, I just mean the non-sugar part of the molecule, and it's effectively in alcohol; but it's like about a C-30 or...I mean, it's huge. There are sterile alcohols, there are triterpenol alcohols. They are huge molecules. But, basically, it's an alcohol.

Question:

So, if you did a sugar test on those samples, you would see glycogen?

Diane Soran:

Oh, am I glad you said that.

Comment: (Inaudible.)

Diane Soran:

That's right, that's right...Larry and I are discussing this.

(Mixed comments.)

Diane Soran:

The point here ... Larry brings up, and I will just jump a step ahead, as what we did is, we wanted to show that if you have already hydrolyzed the saponin glycoside, you did, in fact, have sugar there on the cloth. If you've already hydrolyzed the saponin glycoside, you did have sugar on the cloth. If you haven't hydrolyzed it, you should not have any sugar there. So, what we did is that we took three samples of cloth. This is the sample with hydrolyzed saponin glycoside. This is the sample with unhydrolyzed saponin glycoside; no sugar should be here. And this is just linen; it doesn't have any saponin glycoside on it. A positive test for sugar--and the agent I used is analythiolate (?), which is a spray test. A positive test for sugar is a browning. I'll show you a sucrose test, if you want to see it, where I simply put sucrose on filter paper and tested it with analythiolate (?). And you can see a positive test for the presence of sugar is a gray, gray-brown color. That's just table sugar on a piece of filter paper tested with analythiolate (?).

This, now, is a sample of hydrolyzed cloth. And I think you'd have to admit you've got the sugar there.

This, then, is a sample of unhydrolyzed. You don't really have sugar. You see some slight discoloration, I grant you, but the analythiolate discolors the filter paper, too. And here again...(someone interrupts), nothing, okay; there's a slight difference, but really not ...

Question:

(Inaudible) go through the computer test, or is that just plain nothing, nothing?

Diane Soran:

That's a nothing. It's a slight discoloration. It depends on how much reagent I've sprayed on here.

Question:

The 19-B, did you put any reagent on it?

Diane Soran:

Nineteen-B has nothing; 19-B is just Raes' sample of linen. No saponin on it at all.

Question:

And no reagent for sugar?

Diane Soran:

Nothing. All right, so you can see, if you've got hydrolyzed, you've got sugar present. Now, my hypothesis for the formation of the image on the Shroud is the fact that the image is nothing more than caramalized sugar.

Ray Rogers:

Which caramelizes much more easily...I'm sorry about that.

Diane Soran:

Don't jump the gun.

Question:

Would that wash out of the cloth with water?

(Mixed comments.)

Diane Soran:

I'd love to teach school; ( ( ? ) questions on spinach! Go ahead.

Comment:

I thought we were talking about blood.

Diane Soran:

I moved you one step farther. I thought I had convinced you of the blood. Now I want to talk image. To set up my image talk, I have to convince you of the fact that, if I have hydrolyzed saponin glycoside, there's sugar there, okay? And that's why I tested for it. And if I don't have hydrolyzed saponin glycoside, I don't have sugar there, and that's why we did this.

My hypothesis is: You've already got your bloodstains on your Shroud. Now we've got some sort of energy source, not arguing what it is. This energy source proceeds to hydrolyze the saponin glycoside immediately above the body, splitting it into a sapogenin, aglycone half of the molecule, and a sugar. But this energy source is so intense that it's not happy to leave it just as the sugar. It caramelizes the sugar, giving you that nice brown stain.

Comment:

You could hydrolyze not only by adding water, but also by adding energy.

Diane Soran:

Okay. What I'm saying is in the fetid atmosphere you've got there, you do have some water present.

Ray Rogers:

There's another thing too. Feigel (?) had a term for it, and I can't remember what it is, but it's something like hyperactive water. If you heat a saccharide like this, it begins to dehydrate and it produces water molecules that are in an activated state, and they are very active in that state. If you produce the water by reaction, it's monomolecular water, and it's very chemically reactive, and it will hydrolyze things just like a shot.

Question:

Where is this water coming from?

Ray Rogers:

From the beginning degradation of a polysaccharide.

Question:

What's the polysaccharide?

Ray Rogers:

Your sugar.

Diane Soran:

Your sugar molecule, as Ray says, is a polysaccharine. It is made of a series of pentose, five carbon sugars, and there's some argument there. That's where I've got to do more work. I've got to really look into this structure and synthesize it.

Question:

(Inaudible) hydrolysis to begin with?

Diane Soran:

No, but what you've got...let me...

Ray Rogers:

The molecule is there to start with.

John Jackson:

What does the saponin...when you wash it, does it go inside the fiber, or does it stay on the surface of the fiber?

Diane Soran:

We feel it's simply a surface phenomenon.

John Jackson:

So, are you saying it would be on the surface, and on the surface most fibers would be impregnated with, or coated with this saponin, and therefore that'll be the explanation for what's on the surface?

Diane Soran:

Okay.

Joe Accetta:

That's somewhat of a leading question. Is it an experimental fact, in fact, the glycoside does not penetrate ...

Diane Soran:

It is not. I cannot make that statement, okay? That's what we think...

Comment:

That could be tested, though.

Diane Soran:

Yes.

Eric Jumper:

Yes, but one of the things, is it not true that, once the sugars start to go, that the fiber itself begins absorbing much more readily? Radiation. Initially, it's pretty...

Several voices:

Yes.

Eric Jumper:

So that the fiber itself could then be ...

John Jackson: (Inaudible).

Ray Rogers:

From the microscopic observation on the Shroud, it didn't look like that, because...You noticed, when you were looking through the microscope, that the density of the image seemed to be more a function of the number of the little fibrils in the thread that were colored, than the depth of color of any one fibril or the depth of penetration of the color.

John Jackson:

Like, we've got this one here. It looks just exactly like that.

Ray Rogers:

Okay, well, it was more of a halftone effect than it was depth of color. That could be explained by there being a limiting concentration of saponin on all of the fibers, and you could only get them just so colored by pyrolysis of the saponin on the fiber.

Eric Jumper:

Now the thing, I think, that John's leading to, though--in case you let him finish his question--is that there are places on the Shroud where the image itself didn't seem to set as well, like, for instance, on the sides of the face. And this saponin would coat some fibers better than others, maybe depending on how tightly the threads are twisted?

Diane Soran: Probable.

Ray Rogers:

And what the residual surface coating of the fibril is, or the thread. Because, we knew that there was a variation in density across...as a result of those different lots of thread that were used for the weave. And you can see them all the way, everywhere. If you had more hemocellulose, or more lignin on one batch, the saponin, you would think, would absorb more strongly or less strongly, depending on the surface treatment.

Joe Accetta:

That implies that there ought to be a linear variation in density ... density of the image is proportional to the tightness of the fibers.

Ray Rogers:

Not the tightness as much as the chemical surface treatment of the fiber. Each lot of thread was treated separately.

Joe Accetta:

Oh, okay. Yes.

Diane Soran:

We think it's a uniform washing, but the threads you are washing are not uniform. That's the point.

Bob Dinegar:

This also explains why you could see it better as you stand away from it, because you are looking at more fibers at one time.

Eric Jumper:

In addition, I think the point that Ray mentioned about the fibers take on a satin appearance rather than a shiny one, so it may be a diffusion of the image, as well as seen color. And so, when you get further away, more is scattered out of your line of sight. And you get closer, and it's scattered in your line of sight, and goes away.

Bob Dinegar:

I've seen it the other way around, scattered in and out of your line of sight.

Eric Jumper:

Yes. In other words, if I come on something that's scattering light spectrally, as opposed to diffusely, as I get closer to the one that's scattering the diffuse, it looks more like a spectral reflectance, so it blends in with what the thread is doing. But, as I back off, that stuff that's being diffused is getting out of the collection of my eyeball.

Joe Accetta:

Specular, not spectral.

Eric Jumper:

Specular.

Diane Soran:

Okay, the premise now is we can count for the blood, the hemolysis, the red bloodstain. We can say that the Shroud, the stain on the Shroud itself is caramelized sugar. Let's try and see if we can possibly duplicate this and show it's a surface image. What we did here, again 13 now, is the hydrolyzed saponin, and 13-A is the unhydrolyzed. This is a little more difficult to see, and this is why I should have brought down the microscope.

In the hydrolyzed saponin--these are both, by the way, zapped three times. I have not found the right word yet.

Ray Rogers: Zapped?

Diane Soran:

You said that was all right. I don't know what the right word is.

Comment:

Irradiated.

Diane Soran:

Irradiated?

Comment:

I like "zapped."

Diane Soran:

Well, anyway, zapped with, three times ... the same laser, three times, on both of them. However, this is the hydrolyzed, so the sugar is already available. After three shots, you can really see a burn, really see a scorch. There's sugar there to begin with, because it was hydrolyzed. This is your unhydrolyzed. Now, I don't know if you're going to be able to see ... I'll pass it around. This is the same, three times; but the sugar wasn't there initially. So, part of those three times had to go to hydrolyzing it, and then caramelizing it. So, you can see with the same burst, they're different.

John Jackson:

But it has the same cloth, though.

Diane Soran:

It's exactly the same cloth. One's treated with hydrolyzed; you've got sugar here already, you zap it three times. You can really see you've caramelized that sugar. This one, treated, now, with cold, unhydrolyzed; you zap it exactly the same three times, but part of that zapping energy has gone to hydrolyze the sugar, and then caramelize it. So the stain, you can see, is like...

(Mixed comments, inaudible).

Diane Soran:

If you look at this under a microscope, you will see that this is a surface phenomenon. You will see that it's just the threads, and Ray, could you back me up on this? Ray has seen this one under the microscope.

Question:

What about the other one?

Diane Soran:

This one, again, is just a more serious scorch. Again, it's the surface threads, but it's so much darker to see. But, again, this you can really see the way it's just the fibrils.

Ray Rogers:

I think you can actually see it under that little magnifying lens there.

Diane Soran:

Okay, we could pass it ...

John Jackson:

You would expect it to be a surface phenomenon, anyway, just because of the duration of the pulse.

Diane Soran:

Right.

Ray Rogers:

And it certainly is.

John Jackson:

But it's not necessarily a surface phenomenon because of a treatment that it received.

Comment:

What one might try is a kind of long, lower-energy source like a hot something or other, to see whether you still get a surface phenomenon.

Diane Soran:

These are things we have to find, too.

Ray Rogers:

We did some with a torch, and you can actually sweep an oxacetylene or an oxygen-gas torch across, now. And, after we've seen what the image looked like, you sweep a torch across it and then you just rub it for a little while, to get the tag ends that have been blackened off. It looks exactly like the image.

Diane Soran:

This is the torch; this is a Meeker burner, passing, again, the "A" sample being the unhydrolyzed and, again, this being the sugar. You can see, it's significantly darker ... Now, I passed it through, so of course I may not have done it evenly both times. But, even given that, you can see that it's a good deal darker on the sample that has the sugar there already, than it is on the sample that does not.

Eric Jumper:

When you take an ordinary cloth and take it up to temperatures, say, whatever the temperature of glowing iron is on the stove, an electric burner...

Ray Rogers:

625, 650 ...

Eric Jumper:

... from an iron to an electric burner, and leave it on long enough, assuming the cloth is not wet, the image goes all the way through it.

Ray Rogers:

You begin getting a lot of penetration.

Eric Jumper:

Yes. And the only way you cannot get the penetration, as I mentioned to you before, is to soak the cloth, throw it on the burner, and it throws steam off. And, finally, as it dries out, one area begins to scorch the cloth.

Diane Soran:

If you turn these over, you'll see ...

John Jackson:

Yes, there's no image.

Comment:

But, even then, I think that water plus the heat would trigger the reaction and still give you a penetrating burn. I don't know; we haven't tried that, yet.

Diane Soran:

There are a lot more things that we want to try, but we're just sort of throwing this open for criticism and suggestions.

Ray Rogers:

It's pretty hard to scorch with steam, on a (inaudible).

Comment:

No, he says after it dries.

Eric Jumper:

It throws the steam ...

Comment:

The point is that ...

Ray Rogers:

And it is only on the surface.

Comment:

That's right, but you don't have the thing completely permeated with sugar that's absorbing heavily in the infrared, either. I mean...I claim that if that experiment were done with a cloth that had been pre-treated with saponin, that you would see a penetrating burn.

Comment: These burns were a good deal blacker than ...

Comment:

Not saponin ...

John Jackson:

Why would it penetrate ... of course, if it's all on the surface...

Comment:

Because it's all over; you'd have a strong absorption all the way completely through the cloth ...

John Jackson:

You're just raising your absorption coefficient by ...

Comment (continued):

... because you've changed the reflectivity of the cloth as a whole.

Eric Jumper:

This is most convincing, this (inaudible).

Ray Rogers:

I don't have anything ... you know, there have to be two hypotheses here, Eric: Either it isn't blood, it was painted...it was a red pigment that was painted on in a liquid medium, so it flowed through the cloth, or around the threads; or, it was real blood that has stayed red. If it's real blood that has stayed red, then there has to be some reason for it to do that. And the only explanation we've got at the moment is this one, which would pin it down for a time, roughly ...

Question: Does the saponin tell you the ...?

(End of side 1)

Begin side 2:

Diane Soran:

... zapped that, and I don't remember the number of that. And, again, you can see that same kind of burn. But that does not seem to bear on the particular ...I mean, we've even used oil; I can't find that one right now.

Ray Rogers:

I don't know, I might contend with you a little bit on whether those were (wrapped ?) rubbed on them ...

Diane Soran:

That's only one reference I have. Now, others were that it was sprinkled on. Again, these are all translations. Some say sprinkled. Remember the one I found that said they threw olives on the body? But it was probably olive oil. Or, the body was packed in. You know, this is ... yes, aloe were used, and I've ... but I can't ...

Comment:

... reading about some other possibility, not that ( ? ) yours.

Diane Soran:

Of course not. But, what we're going to do is, we're going to use aloes. We've got aloes. Ray got some aloes. And we've got some myrrh, and we're going to put it on with the vehicle of olive oil.

Ray Rogers:

We don't have any frankincense and gold, though.

Question:

Two questions: 1) What ...do you ... are there any specific chemical tests for the glycoside?

Diane Soran:

Let me give you one more reason why I think this is it, and then I'll talk about how we're going to characterize it.

Ray started to mention the fluorescence. The background fluorescence of the Shroud is a blue. I haven't seen it; but Ray assures me it's a blue. And I've read Roger Gilbert's, at the 450. In the next citation\*, Roger Gilbert used 366 and peaks of 450 ... 365. We used 366 in our little box, and we see the same kind of fluorescence with the hydrolyzed saponin glycoside. So, what we hypothesize is, you've got hydrolyzed saponin glycoside, which fluoresces in the appropriate region. And then of course ... (\* excitation?)

Ray Rogers:

Diane (inaudible), tell them what happens if you zap it..

Diane Soran:

Quenches the fluorescence.

Comment: Right on!

Diane Soran:

You always take my best lines.

John Jackson:

That's, I think, the only way you can interpret those ( ? ) spectrograph (inaudible) that it quenches.

Diane Soran:

What you've got is this background fluorescence and the caramelized sugar quenches that fluorescence, which you would expect. If you've got sugar, it's...

Eric Jumper: That's exactly what Roger said at Santa Barbara ...

Joe Accetta:

So, then, the image should not fluoresce because it's quenching the background ...

Mixed comments:

How do we test for this stuff on the fibers? Is that your next point?

Diane Soran:

It quenches the image, okay, because you've got the caramelized sugar. But I would expect it would still fluoresce slightly, under the image. Now, I don't know if you can see that or not, because you've still got that aglycone half of the molecule there. So, I would say it quenches it, but there might ... there is a residual fluorescence. How obvious it is, I wouldn't say.

Eric Jumper:

There's some fluorescence, but the image itself, wherever there's image, tends to quench out the fluorescence. There's still some there.

Joe Accetta:

Isn't that a point of contention? Whether there's (really ?) some fluorescence on the image or not?

Eric Jumper:

What they are saying is the image is fluorescing, but it's fluorescing less than the background. Therefore, it's being quenched.

Diane Soran:

That would be my ...

Joe Accetta:

That makes sense; but Devan said, "We see no fluorescence whatsoever." (Inaudible) misunderstand....

Ray Rogers:

Roger Gilbert was the guy who did the spectrum on that, and he did the control surfaces, a whole bunch of non-image areas, a whole bunch of image areas, blood areas, the whole works. He got a spectrum for the non-image area; he got a spectrum for the image area. The image area was a lower fluorescence than the non-image area.

Joe Accetta:

But, it wasn't distinctly fluorescent.

(Mixed comments.)

Diane Soran:

It would depend on how intense the image was in that area. The more caramelized sugar there, the less the fluorescence could possibly ...

Joe Accetta:

What I'm driving at is that the fluorescence that we see is statistically significant. Okay, there's no question that what he sees in the spectra is, in fact, fluorescence. And that's the only thing I'm driving at.

Eric Jumper:

And his statement was that he thought, though, that the fluorescence that he was seeing was the cloth fluorescing and the image somehow quenching it...

Joe Accetta:

That makes sense.

Eric Jumper:

... because the fluorescence in the image was less than the fluorescence of the background.

Don Janney:

Now, when we use the word, "quench," are you really meaning quench and that it somehow is inhibiting the fluorescence; or do you just mean an opaque layer?

Diane Soran:

It just means there's something on there; there's something there. That's not fluorescence.

(Mixed comments.)

John Jackson:

Here are the spectrograms, right here.

Comment:

"Attenuation," I think, is the word.

Ray Rogers:

"Attenuation" is better.

Diane Soran:

Okay, "attenuate."

John Jackson:

Here are the spectrograms right now. These are some fluorescence spectrograms taken of clear areas. Then, here are some taken with the image areas over here. And they are characteristically lower in the fluorescence just down.

Question:

But, is there any shifting? There's no shift...?

John Jackson: No.

Diane Soran:

The peaks all seem to be at that 450. It always seems to be the same.

Joe Accetta:

(Inaudible) interesting experiment, to measure the attenuation of masking effects of that caramelized sugar.

(Mixed comments.)

Diane Soran:

That's right; that's exactly one of the things we want to do.

Comment:

Now, the fluorescence is a result of the hydrolyzation.

Diane Soran:

The fluorescence is a result of the hydrolyzed aglycone, yes.

Question:

Was there any area ... I imagine on the Shroud that, out near the edges or away from the image, there might be less energy deposi---, assuming, for instance, that this is the mechanism for getting (?) the image. (Mixed comments.) ...deposition and no hydrolyzation?

Diane Soran:

You run into a problem there. You've got that fire of 1532. There you've got your heat; it was ... water was poured all over it. How much of that hydrolysis in the non-image area is responsible for having taken place in the fire? How much with the residual energy at Resurrection?

Ray Rogers: (Inaudible)

(Inaudible) fluorescence around the scorch areas that Roger saw in his spectra.

Diane Soran:

He sees the green around the scorch areas. Truthfully, we have not, but Larry and I have got a lot of little more definitive experiments to do, in trying to duplicate the severity of the scorch. In other words, we've got to fine-tune that.

Ray Rogers:

...hydrolyzed aglycone, the aglycone is an alcohol. Around the scorch area, you've had a lot of aldehydes. Aldehydes will form acetals, formals, things like this, with alcohols. They would shift the spectrum, the fluorescence spectrum.

Eric Jumper:

One of the things that Roger was saying about the scorches were that they look similar to the body in everything except for the fluorescence, and in the fluorescence, it looked like the parts that were scorched by the 1532 fire did more--if I can call it--quenching. What was the word you decided on?

Answer: "Attenuation." "Mask," "attenuate."

Eric Jumper:

... did more of that than the images of the same reflectance intensity on the body area. But then again, if you look at those areas in the micrograms, those things are all the way through the cloth. And so you'd expect a lot more attenuation, I would guess.

Ron London:

Let me ask one thing. We've assumed these water stains are deposits of mineral in the water. Is it possible for those to be concentrations of sugar?

Diane Soran:

It's almost possible for those water stains to be concentrations of saponin-glycoside solution. If you look at some of these samples--I don't have a large sample here--can you look at the edge? The edge is a lot browner? Where it dried out, can you see the edges here? There's a flow?

Comment:

Okay, we'll radiograph some of that.

Comment:

I think it's the heat ...

Ron London:

I'm not convinced of it, because this is what I'm getting at: If that--and this has bothered me for the whole time--is, we should not see the concentrations of water minerals around those water spots that we do.

Question: Why not?

Ron London:

Because that water would have to stand by itself, Roger.

Comment:

It has to be awfully hot.

Ron London:

Yes. There would have to be one enormous amount of calcium carbonate in it.

Joe Accetta:

Well, they didn't have water softener back then.

Mixed comments.

Comment:

There was another suggestion that was made, if it had been dust and materials in the (inaudible).

Ron London:

This is what I want; this is what I asked about that--it could be the concentration of (drowned out by voices).

Comment:

You could pour rainwater on there and have gotten the same thing.

Joe Accetta:

So we don't know, but there's a possibility that there was that effect.

Ray Rogers:

There was a whole bunch of stuff percolating through the cloth at the time of the fire. Remember, it was in that chest; there was no oxygen in the atmosphere. And you've got formaldehyde--large amounts of formaldehyde--large amounts of furfural hydroxymethyl furfural, a whole bunch of other things, including formic acid. They are produced and they diffuse through the cloth. You dump water on this, bring them into solution, and then migrate it out, and it's going to...just the furfural itself (-----yzes) into a thing that looks like vitreous carbon beneath the dark surface. I got the same thing on those experiments--I wish I had brought some of those slides down, of the experiments that I've done, of paralyzing cloth with all the pigments and stuff around it.

Joe Accetta:

Incidentally, that brings forth another question I was going to ask. How does, or if it does, how does the expected temperature in the casket at the time of the fire, how would it influence the quenching--and I mean quenching in its formal definition--quenching of the fluorescence of the glycoside?

Ray Rogers:

It would cause it to be more fluorescent.

Joe Accetta:

Does the temperature effect, itself, by taking the glycoside-treated cloth and raising it to a high temperature, does it inhibit in any way the fluorescence?

Ray Rogers:

It ought to make it more fluorescent.

Diane Soran:

Our samples of cloth are much more fluorescent than the Shroud. We take just a hydrolyzed sample.

Question: Does it?

Diane Soran:

I haven't seen it, okay? But it's more fluorescent, it's almost more obvious, at least according to Ray. I have not... When you put on the...if you put on cold saponin, and you just look at it under 366, it's a red-blue, like a purplish blue. Remember, I was worried about that. If you put on, though, the hydrolyzed saponin, it's a blue-white; there's a shift there. Okay, now I understand that the Shroud looks more blue-white than it does purple, red-blue. This is under a 366 excitation. So, your unhydrolyzed is a red-blue to the eye. And your hydrolyzed sample is a blue-white. And Ray tells me that the Shroud is more to the blue-white than the red-blue, indicating the hydrolyzed saponin glycoside.

Ray Rogers:

It looked like it to me, but it was very hard to say ...

Joe Accetta:

What I'm driving at is a given hydrolyzed saponin, raise it to a temperature of 200 or 300 degrees, let it cool off, and then measure its fluorescence again.

Ray Rogers:

Very little of the cloth got up to that kind of a temperature. We did the calcu---

Joe Accetta:

Well, whatever temperature that you suspect.

Ray Rogers:

Most of it was at an, essentially, ambient.

Comment:

What I think Joe's trying to say is, "Look, what is it? What would you expect, if you compared the fluorescence in the background against a scorch area, from the glycoside?"

Ray Rogers:

I would expect there to be high fluorescence where the scorch had not been quite hot enough to destroy the compound that had been enough to cause it to break. And that's what you see around the edges of the scorch. And then the temperature drops very rapidly; this is a very steep gradient (or, radiant?) around the scorches on the cloth.

Question:

Were there any photographs that could simulate that, of Gilbert's fluorescence, in other words, exciting ...?

Eric Jumper:

Yes, we do have them. They were displayed up there in the room.

Mixed comments.

Question:

(Inaudible)...such-and-such a radiation, and the picture taken?

Eric Jumper:

They were displayed on the board, and you can order those. Sam unrolled this long sheet ...

Comment:

Yes, I saw that; but I'm worried about the particular (inaudible)...

Eric Jumper:

We know the exact excitation.

Question:

Out of those, what; do they match what Gilbert used in his experiment? Is there an exciting ( ? ) that Roger ...?

Eric Jumper:

I don't know how close they were, but it was a very thick piece of glass lens, taped over the strobes, and it was a dark, dark blue, you know, that kind of thing. So, it's got to be somewhere around the wavelength.

Joe Accetta:

And Roger's experiment was much more selective (inaudible).

Question:

I'm wondering if there's any way in any of the photographic stuff that you can actually look at the fluorescence as a function of temperature, for instance?

Ray Rogers:

I think so. I think that the UV excitation...those, I thought were done with a UV source, not the strobe. The ones clear over ... the ones up front were the visible-light...

Comment: ...yes, the red (inaudible).

Ray Rogers:

...then there was one over on the left wall that ...

Joe Accetta:

They didn't have a UV source, did they? (inaudible) over the strobes.

Comment:

Didn't they have photographs through a ... that there was red and ...

Mixed comments.

John Jackson:

All you've got to do is get above it, and whatever cascade you're going to have is going to happen, regardless of whether you're a little bit above it or much above it.

Mixed comments.

John Jackson:

If you're exciting something by ultraviolet at some wavelength, but what you're looking at is something coming off in the visible, it's a cascade process, just trickling down. Then, when you get into the visible, you're going to get whatever (noise)...

Joe Accetta:

Yes, but, John, there is a small dependence on the exciting wavelength. (Inaudible) function of the wavelength of the excitation source.

Mixed comments.

Ron London:

They weren't up in the morning. Sam put ...

John Jackson: Not the wavelength.

Joe Accetta:

Well, there might be a small effect on the frequencies; I don't know.

Ron London: Sam put those up after.

Comment:

You excite it way up into the band, and then it makes small jumps down to a band edge. Those will all be infrared emissions, or low-energy emissions. And then you get this big transition, where you give off a red, or whatever that are characteristic...

John Jackson:

What I'm asking, is that wavelength that is given off dependent upon what you excited it with, as long as it was above?

Mixed voices.

Comment:

...the energy is, I mean if the intensity is ...

Eric Jumper:

The picture was taken...color-visible. And that's ( ? ) discriminate that is to go into the two-color overlay and try to figure out which one is the brightest. You can't do it perfectly, but you can do it pretty closely; you can visually look at it (inaudible).

Comment (from a side conversation, not in answer to the above):

Yes, that's true, too. That's a possibility, but then you have to look at the energy. If you're talking about 10 volts or something like that, that's quite a lot of ...

Comment: (Inaudible).

Answer:

No, I know it's not, because that's a band-gap in my diamond, or something like that. It's something like 10. And that's completely transparent, so it's not visible, but it is ultraviolet. And I don't know what kind of an excitation source they had.

Question: What part (?) is that?

Eric Jumper:

We know what it is; we just don't know at this moment.

Ray Rogers:

Well, Roger used two different fluorescence excitation wavelengths. One of them was like 250, and the other one was the normal 365.

Diane Soran:

Yes, the ones that we looked at were 365.

Bob Dinegar:

Did I hear you say, some time ago, that aloes were also glycosides?

Diane Soran: Yes, they are.

Bob Dinegar:

Then, why do we have to have Saponaria officinalis on the Shroud, if we accept the burial, piling on, for the burial, of the aloes?

Diane Soran:

1) Historically, we know it was washed; there are historical sources that say it was washed with the saponin glycoside. 2) In terms of the use of the aloes, this again is iffy and really open to interpretation. Was the body packed in it? Was it covered with it? Was it smeared with it? That sort of thing. Then you cannot get the uniformity over the Shroud ...

Bob Dinegar:

I understand all those little things, but ...

Ray Rogers:

Besides which, there wasn't any aloes there.

(Laughter, mixed comments).

Bob Dinegar:

Wait a minute. There weren't any aloes there: Where is "there?"

Ray Rogers:

The anthraquinone has a very, very specific fluorescent spectrum ...

Bob Dinegar:

You mean on the Shroud?

Ray Rogers:

... And as far as "now" is concerned, you don't observe any aloe on the Shroud.

Bob Dinegar:

That answers my question as to whether the aloes could have done it.

Ron London:

Also, Bob, they ...the time frame---if you believe everything---was not right. It was getting close to the beginning of the Sabbath.

Bob Dinegar:

Yes, but this is now Holy Scripture. That's the question...My original question was, and just from a chemist's standpoint, the aloes could have given the same chemical reaction, in your test, as Saponaria officinalis, is that correct?

Diane Soran:

They were glycosized; they certainly could have served as a hemolytic. But I would not...I haven't done anything with aloes, so I wouldn't say that.

Ray Rogers:

Hey, Diane, I don't think aloes is a hemolytic, the way ...

Diane Soran:

Not the way the gypsogenin is.

Bob Dinegar:

That's a known, provable hemolytic agent; there's no question about it.

Ray Rogers:

It's one that's still used in medical ...

Diane Soran:

It's one that was just used as of 1974.

Bob Dinegar:

Absolutely. You find it in any book you pick up, as I thought. Okay, so the aloes probably wouldn't have reacted in ...

Diane Soran:

To that degree. Aloes will break down.

Question:

Do any of these substances have Rahmann active modes that, say we got a little swatch of it; I could take it over to what's-his-name and do some Rahman on it?

Mixed voices.

Question:(continuing):

Well, there's no problem. She's got vials of this stuff, right? Take it over there and ...

Ray Rogers:

You just hit a very sore nerve, of course, because that's what I've been waiting for since December 6, to get McCrone to do (drowned out by voices). We could do Rahman on the samples.

Question:

The other question is, What specific ( ? ) are there for glycoside?

Diane Soran:

They are of the same (inaudible), they have a glycoside linkage.

Ray Rogers:

There aren't any specific two glycosides; there are some specific to certain glycosides. There's no way, without taking (inaudible) and analyzing the sugar moiety in the aglycones that you can tell what the glycoside (inaudible).

Question:

There's no way we can look at the cloth and say, "This is ( ? ) glycoside on it, and in all probability glycoside (inaudible)?" I don't know; I'm asking.

Ray Rogers: If we can ...

Ron London:

That blood, when it's been zapped with ... I just sat here and roughly figured up, to create that scorch...is roughly 135 (jewels?) on that. Do we know what happens to the iron in the hemoglobin, when it's been zapped that hard?

Ray Rogers:

You're hitting the same thing that Diane and I have been talking about with McCrone.

Ron London:  $Fe_2O_3$ ?

Ray Rogers:

Yes. And it looks to me like there's a real, good likelihood that you could do exactly what you are thinking of.

Joe Accetta:

You mean ( ? ) iron oxide out of his zap?

Diane Soran:

Oxidize the iron in hemoglobin, just on the surface.

Comment:

I could zap enough iron that (inaudible) probably.

Question: What's the color of the  $Fe_2O_3$ ?

Question: Now we're looking at  $Fe_2O_3$ ?

Answer: Right. It's red.

Question:

Okay, it's just a color we saw. Another question, and this is why both the sugar and the  $Fe_2O_3$ ...how fixed is that? Physically fixed on the cloth? And the caramelized sugar?

Ray Rogers:

The thing that gets me is that, microscopically, when you were looking at it, and from the photomicrographs that Mark Evans sent me, you can see that this blood flowed on as a viscose liquid. There is no question about that. You can see meniscous marks in there, the whole works. Now, McCrone was talking about you could brush it on with a thumb. It wasn't done that way, because, if you do brush it on with your thumb, you get these very distinct weir patternings, where you get the fine pigment on one side of a fiber and not on the other.

Eric Jumper:

Yes, but he was talking about that in specific answer to the question that I asked him. I said, "You know, it's amazing to me, because we saw some very, very subtle blood marks, or "blood image," on the tip of the nose and the mustache and the beard; and they seemed so subtle that they were something that we had to pick out. It was as if, you know, if somebody was forging it, they wouldn't have put that in; you know, why bother." And he said, "Oh, that's...I could easily, and if I..." (drowned out by voices).

Ray Rogers:

You've got to put it on in a liquid medium.

Joe Accetta:

But there are other methods of application, beside using your finger, aren't there, Ray? You could have used a medium of some kind to put the iron oxide on there?

Ray Rogers:

Sure. But then you've got to remove the medium on the surface in order to get the  $Fe_2O_3$  by itself, the way Walter was seeing it. He said there was no medium there.

Joe Accetta:

There are colloidal suspensions of  $Fe_2O_3$  being used?

Ray Rogers: Yes, but ...

Joe Accetta:

Then why would you have to remove anything? I don't understand.

Diane Soran: You'd see it.

Eric Jumper:

Hold it, though. One thing here that we're completely avoiding is that, if you took a look at the rust from the tack, it is a distinctly different color than the blood is.

John Jackson: Is that  $Fe_2O_3$ ?

Answer: What, rust from a tack?

Mixed comments.

Ray Rogers:

Here's your  $Fe_2O_3$ . Diane has got some of these; I should have ...

Mixed voices.

Eric Jumper:

So, it would change the color?

Diane Soran:

I put it on with (inaudible), with water. You can see the water mark around it, where it's dried.

Comment:

(Inaudible)...little yellow on the end of it.

Joe Accetta:

One of the major barriers on that hemolysis of the hemoglobin, and it ( ? ) colors the fact that we still don't see any potassium or calcium in the bloodstain, and we should see it. I am referring to Roger's experiment. The calcium potassium is not there, or at least does not appear to be. I'm sorry, potassium. It is missing. Now, what would happen to potassium?

Comment: Could it not have been washed out?

Joe Accetta: That's a molecular question.

Ray Rogers:

Did you look in one of the water-stain areas, or in one of the dry areas?

Comment:

I looked for potassium?

Ray Rogers:

Yes. There isn't a lot of potassium in the leading part of the water stain.

Ron London: Do you want a copy of your paper?

Answer: I've got a copy.

Eric Jumper:

Of course, you realize that there is a history. There's some suggestion that the cloth itself was washed and several times sponged off.

Ray Rogers:

I know that in the face area it had been sponged off. That, apparently, was pretty good evidence that, during the time in Constantinople, they used to sponge it off and save the water as Holy Water.

Joe Accetta:

What molecular combination (inaudible) potassium (inaudible) in the hemoglobin structure?

Ray Rogers: It's there as potassium ion.

Bob Dinegar:

I was going to say that, if this thing ever got wet, we might (inaudible). If that ever got wet, there would be no potassium. What were some of the other ions you were looking for, you didn't (inaudible)?

Ray Rogers:

Calcium you might find, because it could be there as carbonate or (inaudible).

Mixed comments.

Bob Dinegar:

And the solubility of the migrate is going to be entirely different (inaudible) potassium.

Diane Soran: That's right.

Eric Jumper:

(does?)

But is/the red color of the bursts (?) around hemoglobin remain exactly the same, no matter what happens to potassium?

Ray Rogers: Oh, yes.

Diane Soran:

The potassium's in solution. Potassium would be in the serum of the blood; it would not be in the hemoglobin. It's a k+ ion; it's a highly soluble salt, just like sodium chloride; just like a salt, which would go into the water.

Mixed comments.

Eric Jumper: Gentlemen, we're trying to tape this session.

John Jackson:

But if you've been thinking that it's been washed, that the image was washed, wetted by the 1532 fire, most of it was not wetted.

Bill Mottern:

Yes, but it could have been washed before.

John Jackson:

Yes, that's right. It could have been by other things. But, I don't think the 1532 fire, the water that put that out, is the thing that you could use to argue that, hey, it was potassium...

Bob Dinegar:

No, my first thing was, I wanted to blame it on the 1532...no, I just better say, "a washing," because I find it hard to believe this thing wasn't washed sometime in 2,000 years.

Eric Jumper:

Professor Byron (?) has a reference that says, I want to say that the name of this princess was Elizabeth, or something like that ...

Comment: Clothilde, wasn't it?

Eric Jumper:

Remember? She said that there's a documented case where she was given permission, and the Shroud was getting filthy, and she very carefully washed it.

Bob Dinegar:

And just very carefully taking out iron (iron ?) flakes, sodium and potassium...

Eric Jumper:

And then she very carefully washed it, and it was done under the supervision of this princess. This is when were there in ...

Comment:

I asked Heller, though, in Santa Barbara, about the lack of potassium in my data, and he said that this did not bother him one bit.

Bob Dinegar: But why?

Eric Jumper: It's the easiest thing to lose.

Comment: He said it's soluble.

Joe Accetta:

I think we need a small experiment to verify that (mixed conversation here) washing iron out of the blood stain.

Ray Rogers: That's what I'd like to see; let's try it.

John Jackson:

When I was washing? (watching?), there's a nice little blood streak right down the hair that's very thin and just very delicate. And I would think that if it had been washed, it would break that up somehow.

Comment:

(Inaudible)...just find out that this fellow ( ? ) cortisone.

Don Janney:

You mean the victim? Cortisone?

Bob Dinegar:

(Inaudible) potassium out of your system. You'd go nuts if you don't take potassium...

Mixed comments.

John Jackson:

What about a severe scourging <sup>or</sup> /torture, or whatever? Would that...?

Bob Dinegar:

Sweat loses potassium, but you don't lose it all.

Ron London:

This is one of the problems that they have with someone that they put on a diuretic, because it pulls all of the potassium out ...

Bob Dinegar:

Potassium is very easy to lose out of your system. It upsets your system, and you start getting...

Mixed comments.

Bill Mottern:

(Inaudible)...unless the Shroud, in ages past, had been washed in ashes and water--(boiled? wild?) water--and boiled in oil.

Eric Jumper:

I think that one is totally fallacious.

Bill Mottern:

I don't know. Now, Sister Elizabeth mentioned virtually the same thing. She says at some time in the past--there's documentation--that, had it been washed with a very strong soap...

Eric Jumper:

Anything that came from Riggi is not too reliable. Now, the thing that Vima was saying...

Bill Mottern:

Even so, if there's somebody digging into it and finding there's a lot of documentation ...

Eric Jumper:

Well, Vima pulled this thing out. It was an account of this supervision of some princess very carefully washing--very carefully, it was under the strict supervision of this gal--and the thing was very carefully washed.

Ray Rogers:

They put it on "delicate" and spun it dry.

Bob Dinegar:

I think the point is here that we have sort of agreed, or we've started coming to the conclusion that maybe the loss of potassium ion is not as serious as it has seemed for the past month to me.

Comment:

...Or identifying it with the "bloodstains" as real blood?

Mixed comments: Right.

Question:

Again, how fixed is that caramelized sugar on the cloth, physically? Can it be rubbed off? Over 2,000 years, 1,000 years, is there a possibility of it?

Diane Soran:

I don't think so. That's just subjective.

Joe Accetta:

I would think that the bonds (?) would be awfully tight.

Diane Soran:

But you've got cellulose there; you've got caramelized sugar adhering to cellulose. I don't think ...

Bob Dinegar:

Well, you know perfectly well, it's stuck on there (inaudible).

Diane Soran:

Did you ever burn sugar water in a pot? Do you know how hard it is to get it off?

Answer: Yes.

Diane Soran:

But that kind of thing, yes, it's very hard. By rubbing and rolling, you're not going to get it off the bottom of the pot. You're not going to get it off unless you scour it.

Bob Dinegar:

Caramelization does mean that it's difficult to remove.

Comment:

Yes, but this is caramelized sugar, not caramelized cellulose. How bound is the sugar to cellulose? (? on last few words.)

Ray Rogers:

It condenses back, and you get your free (three ?) sugar molecules. They start to dehydrate, and they couple. It ought to be a devilishly hard (remainder drowned out by voices).

Bob Dinegar:

(Inaudible) see those lines out there, flipping around.

Mixed comments.

Joe Accetta:

That could be verified very easily.

Eric Jumper:

Roger, remember that we actually pulled the image off with a piece of tape. So, if we could do that with a piece of tape, by pulling the fibers... The cloth has not been damaged badly. People aren't sitting with a scouring pad.

Question:

Was it fibers or image that you brought off?

John Jackson:

We took off fibers, did we not?

Eric Jumper:

It's very easy to remove anything from the cloth.

Diane Soran:

If you take the cloth with it, you're taking the cloth.