here, one that goes more directly to what research is all about. I want to tell you what I think that larger lesson is.

A few years back I became involved with the program of "high speed ground transportation" research and development in the Deaprtment of Commerce. It was an unusual program, and one that caused us to ask ourselves a lot of questions about "research" and what it really is. We found that for starters one has to make some sort of distinction between "basic" and "applied research." Our interests were pretty clearly in applied research; and that is the interest of most of you here at this conference, too.

"Applied research", we decided, was nothing more than part of a structured problem-solving process. Well, a problem is something we have when we think there is a better way; a way to do things or a better state in which things might exist. "Problem solving" is the process of finding and implementing that better way. Applied research is the "finding" part of that problem-solving process.

I was involved with the High Speed Ground Transportation Research and Development Program for three-and-one-half years. I learned a lot more about applied research before I was through. The most important thing I learned was that just knowing how to look for better ways to do things and looking for them was not enough. You have to know what you are looking for.

We had all sorts of whiz-bang researchers working on our problems (and offering to work on our problems) who, it turned out, produced little or nothing of any use to us. They produced little or nothing of use, because they never understood what they were looking for, even though they were skilled "lookers".

I am sure that all of you can cite similar experiences. There is a lesson in those experiences.

Finding a better way requires knowing what "better" is when you see it. It is not enough to be looking. Only people who really know what "better" looks like will (1) find it themselves, (2) recognize when someone else has found it, or (3) recognize that no one has yet found it.

What all that says is that the people who have the problems are the people who should do applied research on them; if, that is, you want that applied research to be effective. That does not suggest that each one of us should personally do all of his own applied research. What it does suggest is that each one of us should be involved in the process of looking for better ways to do our job.

It also suggests that no one should be doing applied research unless there are people who have the problems directly involved in the specification and management of that research. Again, you need people who really know what "better" looks like.

Another way to put this is, "You cannot let someone else do your applied research for you."

I have to tell you that there are a lot of folks in Washington who have not yet gotten that message. They want to do your research for you. And there are folks outside of Washington who are willing to sit back and let the folks in Washington try to do their research for them.

It does not work very well, if it works at all.

It is worth noting that the National Cooperative Highway Research Program, probably the most effective research program in any area of transportation, avoids this mistake pretty well. The NCHRP program puts the researchers (that is, the professional "lookers") together with the people who have the problems (in this case, the state highway departments). It works; as it should.

Well, all of that is what this meeting is about. All of that is what the Transportation Research Board is about.

"....in whatever it is our duty to act, those matters it is also our duty to study".

AASHTO SUBCOMMITTEE ON BRIDGE AND STRUCTURES: PAST, PRESENT AND FUTURE

Sidney L. Poleynard, Louisiana State Department of Transportation and Development

Many of you have expressed a desire to participate in a national bridge conference of this type for several years. We, the members of the Operating Subcommittee on Bridges and Structures of AASHTO have certainly been in agreement with the idea. And we are pleased to take an active part in the program.

Sidney L. Poleynard

I have been asked to make a few comments about our bridge committee, past, present and future. Little explanation is needed as to the make-up and purpose of the committee, since most of you, including our friends from abroad, are familiar with the AASHTO Specifications for Highway Bridges. Briefly, the membership is composed of a representative from each state, District of Columbia, Puerto Rico, the U.S. Department of Transportation and some provinces of Canada. The committee meets in 4 regional meetings each year at various locations in the country. All interested individuals, industries, associations and societies are invited to attend.

Now, where did all this begin? As most of you know, the early highway bridge engineer either had worked for a railroad or was greatly influenced by professors who had designed or constructed bridges for railroads. Certainly, because of need, the railroads in the name of the American Railway Engineering Association (AREA) had a beginning that predated AASHTO by many years. This was fortunate because both the engineers involved and their specification experience, particularly on steel bridges, was a great help to the early highway bridge engineer- and still is, I might add.

Although the Office of Public Roads, the predecessor of the Bureau of Public Roads and, now the Federal Highway Administration (FHWA), had prepared "Typical Specification for the Fabrication and Erection of Steel Highway Bridges" in 1913, the development of the country and the rapid increase in the numbers of trucks and automobiles after World War I gave the bridge engineer a mission we have been working at ever since, -- namely to cooperate with the different states and federal departments and other associations, societies and institutions with a view to assisting in establishing uniform standard methods of design, construction and maintenance and in standardizing as much as possible the various kinds of construction used in connection with highway

development.

Starting in 1921 with this as an objective, several outstanding engineers, either involved or interested in highway bridges, believed we needed standard specifications for our bridges -- not only in steel, but in timber and concrete. Various specification bulletins were published during the twenties, but the truely first AASHTO bridge specification appeared in 1931. This has been constantly changed, revised, and added to until we have the recently published 1977 edition. The increased size represents much hard work over the years by many including the members and their staffs, industry, academia, and consultants. It truely has been a cooperative effort.

We today are still active with 19 agenda items ready for balloting this year. Of particular importance is a proposal for a fracture control plan for steel bridge design and construction. We hope this plan will greatly improve our quality control and quality assurance programs, especially for welded fracture critical members. We have also completed metricating our specifications for soft conversion, a first step to the eventual hard conversion.

We have several items pending for future agendas and discussions. An important one is a problem that has been around for a long time -- and one that perplexed the organizers of the Bridge Committee -- that of design loading. At first, just after World War I, it was military loading, steam rollers and logging donkeys -- now it is the ever increasing size and frequency of truck loading. What are adequate design loadings and geometrics for a bridge today -- and tomorrow? What will eventually be the "ideal" size of a truck and how will increased loads and numbers affect the thousands of bridges we have already built? The solution will not be easy.

Another immediate problem facing the committee is that of hard conversion to metrication. The impact on the designer is probably of the least concern since most of us had a taste of metric units in college physics and we lived through that. But we must remember the craftsmen and industry. The crafts and the workers involved are not as receptive to training, and industry is worried about the economics of the change. This task will not be easy, but the committee is committed to go forward in this effort before the printing of the next edition of the specification in 1981.

Although the future's not our's to see we must prepare for the future. It is comforting to know that the committee is well structured to keep its finger on the pulse of change.

COUNTY BRIDGE PROBLEMS AND NEEDS

Howard E. Schwark, Kankakee County, Illinois

Since the tragic collapse of the Silver Bridge over the Ohio River near Point Pleasant, West Virginia, on December 17, 1967, the public has been reminded through the news media, trade publications, congressional reports and surveys made by many highway related agencies, to name a few, that America faces a serious problem with its highway bridges. To better understand county bridge problems and needs perhaps we should begin our discussion before the Silver Bridge collapse, even though this tragedy was largely responsible for the extensive bridge inspection program which so clearly pointed out the seriousness of structurally deficient or functionally obsolete bridges that were on the federal aid system.

Howard E. Schwark

Most of the structurally deficient or functionally obsolete bridges on the county road systems were constructed in the first few decades of this century. A few may bear plates dating back to the later part of the last century. Considering that these structures, in the main, were designed for horse and wagon loads and their widths were limited to one lane of traffic it hardly seems possible with today's traffic that any of them are still standing. It is further difficult to understand this phenomena when we consider the evolutionary changes which have taken place in the number, size and weight of vehicles traveling over these bridges. I can recall several years back when our threshing crew would disconnect the threshing machine from the steam engine, plank the bridge floor with runners for load distribution, cross the bridge first with the steam engine, then pull the threshing machine across with a heavy log chain. Today loads much heavier than either of those machines cross the same bridge at high speeds building up an impact factor resulting, in some instances, in a higher stress than the combined load of engine and thresher. In my opinion these seemingly indestructible structures designed so well by our early bridge engineers fostered the apathy which has existed in the minds of the public that these bridges would last forever and, as a result, we are faced with today's national bridge crisis.

Instead of local agencies funding a realistic bridge replacement program when the character and type of traffic changed from horse and buggy to mechanized vehicles that continued to grow in numbers and size, most highway agencies spent their highway dollars on building a road system and replaced only those bridges that were absolutely necessary. The rest were kept in service with occasional maintenance being the only attention they received. The reason for this, I feel, can be attributed to several factors. One factor was that counties could build a lot of road for the price of a bridge spanning only a few feet, and the public was demanding from all highway agencies better roads which resulted in local agencies giving priority to roads rather than bridges from the monies available for highway purposes. Another factor was psychological. As long as a bridge was still standing the average driver assumed it was safe to cross irrespective of the load he was taking across and as a result the public never became excited about the need to finance a bridge replacement program. Everybody went over the bridge; seldom did anyone go underneath to see what was holding it up. If they had, we may have replaced more bridges than we have to date. Another factor was that by and large counties did not have professional services available to them for rating bridge capacities. About the only guidelines many counties had for bridge replacement were outright failures and an obvious need to replace due to heavy loads and high