SENATE

Tuesday, November 23, 1999

The Senate met at 1.30 p.m.

PRAYERS

[MR. PRESIDENT *in the Chair]*

LEAVE OF ABSENCE

Mr. President: Hon. Members, leave of absence has been granted to Sen. Selwyn John during the period November 21 to December 3, 1999.

SENATOR'S APPOINTMENT

Mr. President: I have received the following communication from His Excellency the President of the Republic of Trinidad and Tobago.

"THE CONSTITUTION OF THE REPUBLIC OF TRINIDAD AND TOBAGO

By His Excellency ARTHUR N. R. ROBINSON, T.C., O.C.C., S.C., President and Commander-in-Chief of the Republic of Trinidad and Tobago.

\s\ Arthur N. R. Robinson
President.

TO: MR. VINCENT CABRERA

WHEREAS Senator Selwyn John is incapable of performing his functions as a Senator by reason of his absence from Trinidad and Tobago:

NOW, THEREFORE, I, ARTHUR N. R. ROBINSON, President as aforesaid, acting in accordance with the advice of the Prime Minister, in exercise of the power vested in me by section 44 of the Constitution of the Republic of Trinidad and Tobago, do hereby appoint you, VINCENT CABRERA, to be temporarily a member of the Senate, with effect from 23rd November, 1999 and continuing during the absence from Trinidad and Tobago of the said Senator Selwyn John.

Given under my Hand and the Seal of the President of the Republic of Trinidad and Tobago at the Office of the President, St. Ann's, this 19th day of November, 1999."

OATH OF ALLEGIANCE

Sen. Vincent Cabrera took and subscribed the Oath of Allegiance as required by law.

BETTING LEVY BOARD (AMDT.) (NO. 2) BILL

Bill to amend the Betting Levy Board Act, No. 35 of 1989, brought from the House of Representatives [*The Minister of Trade and Industry and Consumer Affairs*]; read the first time.

Motion made, That the next stage be taken at the next sitting of the Senate. [*Hon. W. Mark*]

Question put and agreed to.

GAMBLING AND BETTING (AMDT.) (NO. 2) BILL

Bill to amend the Gambling and Betting Act, Chap. 11:19 and for matters connected therewith [*The Minister of Trade and Industry and Consumer Affairs*]; read the first time.

Motion made, That the next stage be taken at the next sitting of the Senate. [*Hon. W. Mark*]

Question put and agreed to.

TRINIDAD AND TOBAGO RACING AUTHORITY (AMDT.) (NO. 2) BILL

Bill to amend the Trinidad and Tobago Racing Authority Act, Chap. 21:50 [*The Minister of Trade and Industry and Consumer Affairs*]; read the first time.

Motion made, That the next stage be taken at the next sitting of the Senate. [*Hon. W. Mark*]

Question put and agreed to.

NATIONAL RACING COMMISSION (NO. 2) BILL

Bill to provide for the establishment and operation of the National Racing Commission and for matters connected therewith [*The Minister of Trade and Industry and Consumer Affairs*]; read the first time.

Motion made, That the next stage be taken at the next sitting of the Senate. [*Hon. W. Mark*]

Question put and agreed to.

LIMITATION OF CERTAIN ACTIONS (AMDT.) (NO. 2) BILL

Bill to amend the Limitation of Certain Actions Act, 1997 [*The Attorney General and Minister of Legal Affairs*]; read the first time.

Motion made, That the next stage be taken at the next sitting of the Senate. [*Hon. W. Mark*]

Question put and agreed to.

CRIMINAL PROCEDURE (AMDT.) (NO. 2) BILL

Bill to amend the Criminal Procedure Act, Chap. 12:02 [*The Attorney General and Minister of Legal Affairs*]; read the first time.

Motion made, That the next stage be taken at the next sitting of the Senate. [*Hon. W. Mark*]

Question put and agreed to.

ORAL ANSWERS TO QUESTIONS

Queen's Park Savannah (Paving)

The following question stood on the Order Paper in the name of Sen. Prof. Julian Kenny:

Sen. Prof. Julian Kenny: Mr. President, I am afraid I have not received an Order Paper and I am not sure who I should address the question to. I am not sure how many questions I have. [*Interruption*] I have just received an Order Paper. Sorry. Forgive me, Mr. President.

1. A. Could the hon. Minister of Agriculture, Land and Marine Resources inform the Senate of:

i. the approval procedures employed for paving the parade route in the Queen's Park Savannah;

ii. the extent of the area paved;

iii. the cost involved;

iv. the source of the funds for the operations?

B. Could the hon. Minister also inform the Senate whether:

i. the paving was done to standards for roadways including normal foundations, curbing and drainage;

ii. any impact assessment was done;

iii. normal established tendering procedures were employed and if so, who the successful tenderer was?

If the answer to (iii) is in the negative, could the hon. Minister state who the contractor was and what are the general terms of the contract?

Emperor Valley zoo
(Elephant Enclosure)

2. A. Could the hon. Minister Minister of Agriculture, Land and Marine Resources inform the Senate of:

i. the estimated final cost of construction of the elephant enclosure at the Emperor Valley Zoo;

ii. the estimated date of completion of that facility;

iii. the numbers of staff trained to handle elephants and the costs of their training;

iv. the estimated monthly maintenance, including feed costs, of the elephant?

B. Could the hon. Minister also indicate to the Senate whether there are plans to import a mate or companion for the gift animal or any other large mammals?

National Parks
(Consultancy Terms)

3. A. Could the hon. Minister of Agriculture, Land and Marine Resources inform the Senate whether consultants were employed to delimit the proposed Maracas and Matura National Parks in Trinidad and the Main Ridge Park National Park in Tobago?

B. If the answer is in the affirmative, could the hon. Minister state:

i. who the consultants were;

ii. the date, period, terms and costs of the consultancy;

iii. the source of funding for the consultancy;

iv. whether Government approved of the commendations of the consultancy?

C. If the answer to (iv) is in the negative, could the hon. Minister state who was responsible for delimiting the proposed parks?

The Minister of Public Administration (Sen. The Hon. Wade Mark): Mr. President, I seek to have the answers to the above questions 1 to 3 deferred for one week.

Questions, by leave, deferred.

SCIENTIFIC RESEARCH (POLICY GUIDELINES)

Sen. Prof. Julian Kenny: Mr. President, I beg to move the following Motion standing in my name:

Whereas it is widely accepted that scientific research and technological innovation, frequently driven by individual human curiosity and creativity, has contributed immensely to social and economic development of societies; and

Whereas there has developed in Trinidad and Tobago over the past three decades a wide range of scientific research programmes and institutions associated with different sectors of the economy; and

Whereas scientific research and technological development in all societies has had to rely on increasing costly manpower and technologies in the pursuit of solutions of developmental problems; and

Whereas the size of the economy of Trinidad and Tobago places restraints on the quanta of resources which might be applied to research programmes and institutions;

Be It Resolved that Government states and elaborates its policies and priorities for the general direction of scientific research and technological development in the country and measures which it might take to ensure more efficient use of resources in the pursuit of these policies.

Mr. President, I am prompted to introduce this matter for a number of reasons. One is that we spend a comparatively large part of our national budget on science and science-related institutions. There is no way that we can quantify the money that is actually spent on scientific research, *per se*. It is, nevertheless, as I will show later on, a fairly substantial sum devoted to the general area of science and technology. The other reason for proposing this Motion is that the Government of Trinidad and Tobago, the present administration, has made it a matter of importance, nationally, that everyone is accountable.

Now, we have heard discussions about the accountability of the Judiciary and I accept the argument that one can have an independent Judiciary at the same time as it is possible to require this Judiciary to be accountable financially and administratively. The Judiciary costs about $80 million a year and I dare say that expenditure on science and science-related subjects and technology goes way beyond that. So I think it is appropriate that perhaps we might consider this particular area, scientific research, along these lines.

Now, most persons who have not been trained in science become a bit alarmed and distant from science mainly, I think, because of the vocabulary. When, as a biologist, I speak to somebody else and I use terminology, unfortunately sometimes I assume that everybody understands the terminology; similarly, when I hear someone from another discipline speak, I have to prick my ears up a bit to catch what is going on.

1.45 p.m.

I think, however, there is nothing that mystical about science. The basic understandings are there. I would not attempt to unravel the mathematics behind the concept of say, a singularity in theoretical physics, yet I have an understanding, having read Stephen Hawking's *A Brief History Of Time*, of what this is, immense density that is capable of bending light, gravity and so forth. So, I do not think that we really want to argue so much about the vocabulary of science. I think the broad sweep of it is within the competence of understanding of the majority of people, if we stop using the jargon and we try to explain what are the ideas.

Science, as we know it today, attempts to give an understanding of events or the environment around us and falls into two natural groupings—one is the natural sciences, originally referred to as natural philosophy and the social sciences. Both disciplines attempt to use the same basic approach, that is, you must formulate some sort of hypothesis. You must collect your facts and then you must test them, hopefully arriving at some conclusion by experimentation. There is an important element of science which is, that what you propose must be subjected to critical examination by your peers.

There are many people who expound—I was frankly rather amazed at a television broadcast where one of the maxi-taxi drivers was explaining this phenomenon of young girls and taxi drivers and he blamed it on the girls and he said, "It's on the vibrations. This is a fact." He said. "It's the vibrations." Now, this is not science. I mean, we all heard this. He said, "Vibrations on the cruise

ships cause people…" He used the words "to be horny". Now, this is not science. Any science that is worthy of the word, as being scientific knowledge, has to be subjected to, as we say, peer review. It has to be critically examined and if there is enough consensus, it is one of the building blocks of science.

So, science is not only the way in which you create this knowledge, it is also the body of knowledge itself. Science grows. Our understanding of what is around us physically or what is around us socially is the body of science, and this thing expands as societies grow.

Mr. President, there is one thing that has bothered me over the years about the word "science" in Trinidad and Tobago and that is, the term is used in a casual way and you frequently hear that so and so is a scientist, so and so is a geologist. In fact, I make the distinction that a scientist is a person who creates scientific knowledge in accordance with certain basic principles of study.

So that when you hear that somebody is a geologist, the person might have gone to the University of the West Indies and got a BSc in geology and the person may call himself a scientist. Or a person may be doctor somebody, will have done a Ph.D and entered a scientific administration, not having done any original science, except the Ph.D and there are occasionally people who get Ph.Ds who, in fact, end up doing work that is totally unrelated to science. So that I will confine my comments to scientific research, insofar as the nation is involved.

Mr. President, we have made some really remarkable scientific discoveries or achievements over the past century. In fact, one of the noted achievements was unravelling the transmission of rabies via bats. This was done by Dr. Lennox Pawan and this was done in a pathology department at a hospital which people might not regard as a scientific institution today. Nevertheless, Dr. Lennox Pawan sort of got behind his microscopes and his animals and he was, in fact, the first one to make the link between the rabies disease and the vampire bat, the first one in the Western Hemisphere. He goes down in the annals of science and even today you still see reference to his work.

I might point out, also, the Ministry of Energy and Energy Industries has recently published a geological map of Trinidad and Tobago. It is a superb piece of work and this work originated, as the Minister will no doubt confirm to anyone, in the early part of the century with Hans Kugler who was a geologist, but it has been refined and expanded with inputs from the Ministry and Mr. John Saunders who worked in Trinidad and Tobago for 23 years or so, and now we have a

superb account of the geology of Trinidad and Tobago graphically. It is a superb piece of art as well as science.

There are many other people who have made major contributions. I just mentioned this in the historical context of science, the research. David Lockhart—the name probably does not mean anything to anyone except to Sen. Prof. Spence and I—was a curator of the Botanical Gardens. He was one of the leading scholars who, in fact, produced or commenced production of the Flora of Trinidad and Tobago which is a scientific catalogue of the plant materials which we find in Trinidad and Tobago.

Mr. President, if we look at the present time, today there is a wide range of institutions involved in scientific research, and I emphasize there is no institution that is involved in pure scientific research. All institutions in the country which I list will have other functions, but I mention, for example, the range of institutions—the Central Experimental Station at Centeno; the Forestry Division; the Fisheries Division has a research unit; the Caribbean Epidemiology Centre (CAREC) is a disease monitoring institution which also does scientific research. We have one international institution which we do not fund, CAB International, which is a biological control institution. We have the Faculty of Agriculture and Natural Sciences; the Faculty of Medical Sciences and Engineering. We have cocoa research—these are all quite discrete bodies; we have Seismic Research; we have the Caribbean Agricultural Research and Development Institute (CARDI); the Caribbean Industrial Research Institution (CARIRI); the National Institute of Higher Education (Research, Science and Technology) (NIHERST); we even have a non-governmental organization that publishes a scientific journal which gets recognition in the world of science. That is the Trinidad and Tobago Field Naturalists Club, which publishes a scientific journal, listed in the world list of scientific periodicals, and published once every two years. We also have Asa Wright which does not necessarily do scientific research, but which accommodates visiting scientists; and we have the Institute of Marine Affairs. There is a wide range of institutions.

Now, the bulk of these institutions are funded by Government agencies. There is no doubt that some of the funding comes from other organizations. For example, the Caribbean Epidemiology Centre gets funding from the Pan American Health Organization and from a range of other institutions, the European Union and so forth.

Mr. President, I have tried to figure out, to estimate some sort of quantum of expenditure, and I emphasize, again, the figures I give you do not represent pure scientific research; they represent the costs of different institutions. But there are

three ministries which play a key role in that they manage the administration of the funds which we see appearing in the budget.

The first one is the Ministry of Planning and Development—I will give a figure in a minute—and then there is the Ministry of Agriculture, Land and Marine Resources and then there is the Ministry of Health. By far, the largest block of funding goes via the Ministry of Planning and Development to educational institutions including the University of the West Indies, the Environmental Management Authority, the Caribbean Institution of Research, Science and Technology, NIHERST and the Institute of Marine Affairs. These are all institutions of one kind or another.

The funding that goes to the university—and it goes to all aspects of the university—is $377 million, which is a fairly large sum of money. I have taken this from the budget, from the Recurrent Estimates. The Environmental Management Authority and Caribbean Institution of Research, Science and Technology take about $12 million; NIHERST and the Institute of Marine Affairs together take about $31 million.

In the Ministry of Agriculture, Land and Marine Resources Unit, there are many different organizations or institutions like the Cocoa Research Unit, the Caribbean Agricultural Research and Development Institute, the Food and Agriculture Organization, CFTDI, the Sugar Cane Feed Centre. These are institutions of one kind or another and the Ministry of Agriculture, Land and Marine Resources channels funding to these bodies, and this works out to about $14 million a year.

The third one is the Ministry of Health which manages the disbursement of funds to bodies like the Caribbean Epidemiology Centre, Food and Nutrition Institute, drug testing and so forth. That amounts to about $6.7 million.

Now, the total sum, when you add it up, is about $442 million and these are the sort of science-based organizations/institutions.

I would suggest that it is impossible to make a precise estimate, because a body like the University of the West Indies does more than scientific research—it does teaching—and there are other faculties like the Faculty of Humanities and Education; there is Legal, Law Schools and things like that.

It is beyond my resources to fine-tune the thing to give a figure, but just as a guess, I would suggest that we might be spending in the order of $200 million—

$250 million a year on scientific research and scientific education and I emphasize this is only a guess, because I have communicated with all the bodies involved and I have got very, very good responses from them. I have a pile of annual reports of the different organizations, yet I have been unable, with all the talk of freedom of information, to get any annual report of what goes on at the Central Experimental Station at Centeno, or any idea of what fisheries research goes on at the Fisheries Division, or what goes on in forestry or what goes on in the Sugar Cane Feed Centre.

So, you look at the budget and you see there is a fairly hefty personnel cost at the Ministry of Agriculture, Land and Marine Resources, but there is no way, in the estimates, that one can pick out or isolate that which is devoted to research in agriculture for fisheries or forestry.

2.00 p.m.

Mr. President, this Motion is raised because there are a number of issues which are not unique to Trinidad and Tobago. There are a number of issues associated with scientific research and technological research and development. I will identify some of the issues so that the response will suggest the policies that might be developed to deal with these issues. One of the first issues is that of duplication of scientific effort. This is a very real issue. In my own experience, I can tell you that the Fisheries Division has been doing aquaculture research work; the Institute of Marine Affairs has been doing aquaculture research work; the University of the West Indies Department of Life Science has been doing aquaculture research work; and the Sugar-cane Feed Centre has been doing aquaculture research work.

There is no commercial aquaculture in Trinidad and Tobago. There is a little subsistence—people keep fish in their ponds—but there is no commercial food production in aquaculture, whatever may be said. So, here we have one particular area in which there is a degree of duplication, and there must be a way in the conservation of our limited financial resources of developing policies which direct the research in aquaculture, if it is necessary, to one source. There is no point in everyone doing it.

I am sure that there are other areas—possibly Sen. Prof. Spence, if he speaks, may refer to this—and I am sure that the hon. Minister in the Ministry of Finance has extensive experience in agriculture. He may have seen problems in agriculture where there is duplication of effort. In agriculture, we have the University of the West Indies Faculty of Agriculture and Natural Sciences, we have CARDI and we

have Centeno, and I am sure there are other organizations which may be involved. So, there is a critical issue of efficiency. How do we ensure that we do not go off in different directions and we use our resources more wisely?

Mr. President, another area of concern for any country—and this applies to most countries with which I have had some experience—is the question of the output and the quality of the research. I am talking about scientific research. The question of the output and quality. I will refer later on to some problems of output and quality.

How does one determine output? Output is normally the research report published in such a form as to be of use to other scientists. There is no point in doing research and putting it in one's back pocket. It has to be communicated in a form which can be evaluated by other persons. The quality of the research is also important. Sloppy research, where one does not follow the protocol, leads to unjustified conclusions, and when one accepts these conclusions which sometimes are necessary to inform policy, one's policy becomes flawed. So, the actual output, the form of it and the quality of it are most important. As I will point out later, the output of scientific research in Trinidad and Tobago and its quality is extremely uneven.

A third issue is that of this rather foolish argument about pure research and applied research. I have never really been able to understand why people raise this issue. There is really only one issue, and this is the quality of the research that one does. The quality of the research that we are able to do in this country will be determined to a large extent by the important issues that face us. I would suggest that it is not an issue that the Government of Trinidad and Tobago—this one or any other—will have to concern itself with. The real issue is the quality and depth of what is done.

Mr. President, there is also among certain circles the question of the relevance of the research which is done. One of the problems to which I will refer when I make my comments about the University of the West Indies is related to teaching. One of the problems with this argument about the relevance of research is that it is almost impossible in any field of scientific research, except the most abstract theoretical physics, to determine whether or not a line of inquiry which leads to the production of scientific knowledge is relevant. I will illustrate this point by mentioning some of my own research.

One of my passions in life was research on frogs. To most people, “Good Lord! What on earth is this? What is the relevance of this to Trinidad and

Tobago?" And, another passion in life is research on the fresh water fish of Trinidad and Tobago. I will point out the relevance of this. Today, the receiving environment from all the effluence and all the pollution that go into our rivers that cause these problems has its own life forms—fresh water fish and frogs—and these are the most sensitive of organisms to pollutants. Many insects and crustaceans are very hardy, but once the oxygen levels drop in the stream, the fish start dying. So, there is an early warning system which sits there.

When I started this work as a young person, I had no particular notion that I was solving a problem for Trinidad and Tobago. It is just that I liked fish and frogs. I am a biologist. Yet the information and the knowledge which are now available—there is a monograph on the fresh water fishes of Trinidad which I published, and there is a monograph on amphibians which I published. It is available to the people as what we call indicated species. If one goes into a stream and such and such is missing, one will know that there is a pollution problem. If one sees fish going belly up, one knows that there is a pollution problem. It is an early warning system. I just mentioned this because I was personally involved in this particular research.

I turn next to another issue: the training of the researcher. Until comparatively recently, scientific research in this country was done by people who were trained abroad. There is only one institution which is responsible for the training of persons in academe, the training towards first degrees and for those who go on to higher degrees. This is the University of the West Indies. There are not many institutions in Trinidad and Tobago which offer training and research, unlike North America, the United Kingdom or Europe where a person in industry can, in fact, be trained in industry towards a higher degree and, may be supervised by somebody in industry and get a fully examined higher degree from a university. It has happened. It is reasonably common.

Mr. President, there is another issue of rewarding the researcher. This is a critical issue if we want to build up quality research in the country. A middle rank researcher in the United States in a quality research institution is probably thinking in terms of US $50,000 to $70,000 per year. In Britain, for a middle researcher in one of the big research organizations, maybe a pharmaceutical firm, we are talking about £45,000.

This is one of the critical problems that we face. In fact, it is not only us in Trinidad and Tobago, but also in the West Indies. If we want quality research, we have to pay to bring this to us. Herein lies a problem within the university.

Rewarding the researcher at the university is through a bargaining system with a union and it does not matter who one is. The top researcher, the person who is really highly productive, will get exactly the same reward as the academic deadwood who has been around for 20 years and is producing nothing. He teaches his class. It is exactly the same thing.

Every time there are negotiations between the Government and the University of the West Indies, there is always the issue of one formula. A university administrator gets the same reward as a top researcher. In fact, some of the senior administrators are super professors. Registrars and bursars are above the people who actually create what are the products of the university: quality research, quality teaching and quality graduates. I mentioned that there is an issue. There is no point in giving another 27 per cent increase at the next triennium. It is not going to produce any more quality research.

Mr. President, I turn briefly to some of the institutions and, again, I have to talk about all institutions. The last time we were debating the establishment of the Technical University of Trinidad and Tobago, I made what I considered a fairly benign statement. I pointed out that there appeared to be a problem with the throughput of the undergraduate teaching in that a three-year degree, according to the university, not me, took 4.4 years and a four-year degree took on average 6.2 years. This was not my invention. I took it out of the official document.

The other point I made was that there appeared to me to be an under-performance problem at the senior levels of the faculty to which I belonged. This resulted in statements coming out in the *Trinidad Guardian* which were defamatory of me and my reputation. Not that it bothers me in the slightest. I am not going to sue anybody, but I thought that if the *Trinidad Guardian* is present and they wish to make any comment on anything I say, I am quite prepared to let them have my notes so that when the sound bite is published in the *Trinidad Guardian*, we do not have the bureaucrats rising and making all sorts of statements which roll off my back. My first comment, obviously, had to be with the major research institution of the country and the region.

2.15 p.m.

Mr. President, taking the official reports of the University of the West Indies for the last two years, I am frankly alarmed at what is being delivered as an annual report. All universities take pride in their reports. They take pride in listing

their researches and they take pride in the format in which they report their research.

In 1997, the university put out its reports. They are very thin documents, with many colours, glossy paper, many pictures, empty spaces and also there are many typographical errors. Here was the University of the West Indies unable to spell the first name of its vice-chancellor. It is there for anyone to see; this is an official document on lovely paper. The University of the West Indies unable to spell the name of William Demas. In the same paragraph they spell Demas as Dumas. It is clear that nobody reads this. Who is it intended for? The point I make here is this report went out without a publication's list. I think Sen. Prof. Spence, in one of the other debates, made the point about do we know what is going on, we are spending millions of dollars and they are not telling us about their research.

Then there was a change in the new format of the report. It is the same; it is approximately 30 pages. There is a list of publications and there are numerous errors. When they dealt with the registration of students—if one looks in this report one will see 34 per cent of the enrolment is in the law school—it is an error. It is clear that nobody reads this. I went into the report; it lists all the publications. I cannot imagine how a university can put out a list of publications in which they mix up everything: their journals and peer review papers were mixed up near to some abstract. They were mixed up next to something—a little conference held down at the Learning Resource Centre—where they had titles of papers but no journals or titles of papers but no pagination.

University documents; theses and so forth are very thorough in the way they approach the business of reporting. What I found rather alarming is that if one took the science-based faculties, their publications and their peer review publications—which is a thing, if one is a scientist one works to get one's work published in something that is reviewed internationally, that output is low.

There are six departments in the Faculty of Agriculture and Natural Sciences. It is quite uneven: some departments publish what we call "an awful lot of chaff" that is, it has not been peer reviewed. If one renders the thing down, one will find less than half of the peer reviewed publications. If one looks at the three faculties—again the Faculties of Agriculture and Natural Sciences, Medical Sciences and Engineering—if one does the comparison, there is a serious problem, in that, the Faculty of Medical Sciences honestly puts down its publications and journals, there is pagination and so forth. The Faculty of Agriculture and Natural Sciences puts down a lot of chaff, but it still puts down

some details of some of the publications. The Faculty of Engineering—if one looks at the list of publications, it is in the report here—I feel much concern for what is happening in the Faculty of Engineering. In fact, I have much concern for what is happening in the University of the West Indies.

I do not want to labour this too much because I would like to make a small point about the University of the West Indies. Already, I am quite worried. According to the *Trinidad Guardian* of October 31, 1999, the Chancellor reported that there has been a decline in the student numbers: 1.7 per cent over the pervious year and 3.5 per cent of postgraduate. Clearly, there is a problem with what has happened with the university. Clearly, with the increase in fees and competition from other parallel universities along the East/West Corridor, there has been a problem, but not in science.

Mr. President, also related to this issue of research—I mentioned it earlier, it is the training of research—if one looks at the report it claims approximately 1,500 postgraduate students. The term "postgraduate" is used rather loosely. It is sometimes spelt post and graduate and sometimes postgraduate. When one looks at the numbers of postgraduate students and separate those that are research degrees—that is M.Phils, Ph.Ds and research MAs—one will find that the number graduating is very small. I am not inventing it, I have the information.

I wrote the University of the West Indies asking for information. I did not get the information at St. Augustine so I wrote the University of the West Indies, Jamaica pointing out that I am a Member of Parliament and I would like the information for a debate. Lo and behold, I got a very prompt reply. If one looks at the number of people who are registered for these degrees, and the number of people who actually graduate, we have a very serious problem, in that, there is considerable wastage.

There are many people who simply do not complete. Many of the courses are for a period of three years. There are large bars of people who are registered for higher degrees. Most of them are non-research qualifications and the others are M.Phil., Ph.D. and MA qualifications. If one looks at the graduatess on my graph, one can hardly see the graduates. This is based on information taken from—I have not invented anything—official communication from the university. There is a serious problem of wastage, which must be addressed, and these are the people that we are training for research.

If I leave my old institution and turn to some of the other bodies, just to wrap up: to show you why divergence in performance. The Seismic Research Unit is a

small group which is concerned with monitoring earthquakes and volcanoes and is funded by regional governments. The Seismic Research Unit is primarily a monitoring institution but it has a distinguished record of scientific research published in primary journals. If one reads the annual report one will see where peer review journals, publications and other various conferences and seminars are listed. This is the norm in any university. The Seismic Research Unit has an outstanding record. May I point out that the Member for Diego Martin West is a professional geologist who has a distinguished record at the Seismic Research Unit.

2.25 p.m.

Mr. President, I just mentioned a few of these institutions. If you take the Cocoa Research Unit—and not because Sen. Prof. Spence is here, he has led it for several years—it is, again, a classic reporting. The Cocoa Research Unit is supervised by a body of advisors and funders and their report is a dream to read in that you get a background to the institution, you get an update written in scientific form, and then you get a list of publications, peer review publications, as well as the others. That is the Cocoa Research Unit and it compares with the Seismic Research Unit.

The report from the Caribbean Epidemiology Centre (CAREC) is also a dream to read. It is one of those reports where the lay reader—because it is written in a form with the graphics—is able to grasp very, very quickly what CAREC is doing, the problems of HIV, of tuberculosis, of airborne diseases in the Caribbean and so on. Again, CAREC does what all good research institutions do; they will give you a list of their publications, peer review and so forth. I would not labour it.

The Caribbean Agricultural Research and Development Institute (CARDI) is another organization. On reading its reports, I get the impression that CARDI is more a development, a rather fancy extension institution—reading from its reports. When you read its report there are many, many technical reports but no references to peer review publications.

Mr. President, there is clearly a problem with the Caribbean Industrial Research Institute (CARIRI), because the latest report I could get was 1994. If you are pumping $10 million or whatever it is into an institution, surely, that institution must be accountable, must be made to report. The report, in fact, is mainly a financial report and it does not really explain what it is doing.

Mr. President, I am rather distressed to refer to the annual report of the Institute of Marine Affairs. This costs the taxpayers about $10 million a year and in the report, which is fairly long, there really is not any communication about—they have a list of publications, but their publications are not peer review publications. What they do have, however, is a long list of technical reports. Herein lies the problem for the Government, because this is the premier institution to advise the Government on technical matters relating to the sea and the marine environment. They are supposed to be doing research on the marine environment, but they are in business. They seek and are awarded contracts to do marine research for clients and, occasionally, you have this rather bizarre situation where the principal adviser to the government on marine matters will not give information which it has to a government ministry because the government ministry is not the client. I am sure that there are people present who will appreciate what I am talking about.

Here you have an institution which is set up by an Act of Parliament to do research on the marine environment and it spends most of its time trying to earn fees in competition with people who have to pay business levy and income tax and so forth. There is nothing in the report that inspires much confidence for the future. It is not really a research institution; it appears to be a consultancy business. What is rather alarming, it goes through page after page telling you the qualifications of people. Then it goes page after page telling you that this one attended a task force meeting, this one took an Excel class, it goes on a page of training. So, if they would spend less time doing this kind of thing and get down there to basic research, which is what the country needs—this is what we are paying $10 million for. So, there are issues within the government institutions where the Government actually controls the institutions.

I might point out that the Government has a serious problem in having its own ministries account for the research that they do. The Central Experimental Station: I have spoken to the Permanent Secretary, I have written to them, they are trying to get me information, but I rather doubt that anything would be forthcoming. There is no way that I can estimate what is spent, but you go out to Centeno and you see several buildings and laboratories and staff, or you go to the Fisheries Division at Chaguaramas and you see people down there busy doing things, but unless they do research, and publish the research, it has no value whatsoever. So, there is an issue here with one of the government institutions—not the only one.

With regard to the National Institute of Higher Education (Research, Science and Technology) (NIHERST) my interpretation of the annual report is it is really more concerned with science administration. NIHERST, in fact, supports scientific meetings of one kind or another. But the bulk of what they are doing is really science administration and supervising some of those courses which are associate degree courses.

Finally, Mr. President, I would like to mention one organization with great praise for them. This is Caroni (1975) Limited. Would you believe this? Caroni (1975) Limited has a small research laboratory concerned with problems of cultivation of the crops of Caroni (1975) Limited. I asked for their reports and they said, "How many do you want? We have an annual report for every year", so they gave me the last three. This is written as scientific reports are written: introduction, methodology, data and so forth. It is written like a scientific journal. I am pleased to note that some of the work that takes place down at the Caroni (1975) Limited research laboratory—which originally for many years was run by the late Dr. Tommy Carr—they actually get their research into international journals. For example, this year one junior researcher has published "Pest–New Host", in a journal called the *International Journal of Pest Management, 1999*. So, if somebody down in Waterloo can do this kind of thing: Why can we not see it in the Institute of Marine Affairs or other institutions? We see it in Cocoa Research. We see it in Seismic. So, here we are, spending these large sums of money and we are apparently not getting what is expected of any self-respecting scientific institution.

Mr. President, I would close by noting just a few points. One is that it is most important that the Government crack the whip on its own ministries and get reports from the Fisheries Division, the Forestry Division, and the Veterinary Diagnostic Laboratory. There are a couple of other scientific institutions that I have not been able to establish contact with. One is the Bureau of Standards, which is concerned with standards, obviously; and the Forensic Science Centre, which of course is highly specialized.

I will point out also that I continue to be a little worried about the lack of public geological research in this country. Most of the geological research, of course, has been done over the years. There is a body of information—published in international journals—it is available, and this has been done largely through the oil companies. Now that we have a comprehensive geological map, I think that there are probably a number of issues related to resources other than petroleum and gas that might be profitably pursued, if we could somehow

influence somebody somewhere to get involved in the conventional open scientific research. I accept the oil companies if they do research, it would be at their cost, and they do not have to go public.

These then, Mr. President, are my broad comments on the Motion and I sincerely hope that from the Government's side we get some guidance from the ministries which handle these comparatively large sums of money—particularly from the Ministries of Planning and Development; Agriculture, Land and Marine Resources; and Health—and that somehow, we develop the mechanisms for making the process more efficient.

Mr. President, I beg to move.

Seconded by Sen. Prof. Kenneth Ramchand.

Question proposed.

The Minister of Energy and Energy Industries (Sen. The Hon. Finbar Gangar): Mr. President, as I begin my contribution on this very important Motion this afternoon, I congratulate Sen. Prof. Julian Kenny on his foresight and insight in bringing this particular matter to the attention of this honourable Senate. I think it is very appropriate and timely that we should be debating such an important topic. I also congratulate Sen. Prof. Kenny on his very learned and lucid presentation this afternoon, which, to my mind, has been one of the more interesting contributions I have listened to over the past four years that I have been here.

I think Sen. Prof. Kenny made two important points early on in his preamble to this Motion where he acknowledges that "scientific research and technological development in all societies has had to rely on increasing costly manpower and technologies in the pursuit of solutions of developmental problems"; that is the first point he made in his preamble.

The second point is that the size of the economy of Trinidad and Tobago places restraints on the quanta of resources which can be placed into research and development. So, already in his Motion, he has identified two major problems which a country like Trinidad and Tobago would face with respect to scientific research and technological development and that is: it is a very costly endeavour and it requires a tremendous amount of resources in a country with limited resources as Trinidad and Tobago.

However, Mr. President, I want to assure this honourable Senate that the Government recognizes that scientific research and technological development are

prerequisites to ensuring that Trinidad and Tobago remain on the competitive edge of technology on the international front.

However, there are a couple issues which must be highlighted up front. The first one: Is it appropriate in the context of Trinidad and Tobago to import the results of scientific research or should we do it all by ourselves? A similar question can be asked with respect to technological development. Do we import it? Is it more cost effective to import, or should we develop it ourselves?

2.40 p.m.

The second question which is my first area of disagreement with the distinguished hon. Senator is whether it should be pure research or applied research. Sen. Prof. Kenny is postulating that it does not matter. The other question is, does the relevance of the research really matter? I think when we are competing for scarce resources we must determine whether we should go along the lines of pure research or applied research. We must also take into account the question of the relevance of that particular research. For example, there are certain funds available to the Minister of Energy and Energy Industries. Do we support a project at the University of the West Indies which may deal with Einstein's theory of relativity and black holes? Or, should we deal with the research area such as the geology of Trinidad and Tobago or, the types of catalysts we use in petroleum refining operations or, should we deal with optimal utilization of our asphalt? Those are the decisions we, as policymakers in the Government, have to make.

I would appreciate hearing from Sen. Kenny some sort of response and guidance as to how we should proceed. Because we as Ministers in the Government have to make decisions from time to time, which those matters directly impinge on: whether we should focus our efforts on pure research, applied research or a mixture of both or, should we take into account the relevance of the research.

We in the Ministry of Energy and Energy Industries has been in the forefront of research and technological development. Another area where I did not hear much from Prof. Kenny is with respect to a part of the Motion—technological development. He did not deal much with that, but mainly with the area of scientific research. These are the primary interests of my Ministry, in its capacity and in its role as manager of the hydrocarbon resources of the country. Not only in scientific research, but also in technological development.

In fact, Mr. President, and hon. Senators, research and development is a critical element of the Energy Policy Green Paper which was tabled in this honourable Senate and it will also be a critical component in the White Paper when it is tabled in a few weeks' time. I would say that the Government, through the Ministry of Energy and Energy Industries, is committed to research and development, particularly in the energy sector.

We have a multi-pronged strategy—which will be quoted in the White Paper when we put it out in a few weeks' time—that we are going to employ with respect to scientific research and technological development. The first one is the changing of the emphasis of education in this country, at the primary, secondary and tertiary levels to make it become more technology oriented. I will deal with that a little later in my contribution.

Secondly, ensuring that the country benefits from international industrial research efforts through the introduction and utilization of cutting-edge technology in the energy sector.

Thirdly, encouraging and granting support to the private sector through direct involvement of state agencies in the provision of necessary infrastructure and facilities.

Fourthly developing and monitoring energy research projects by the Ministry of Energy and Energy Industries in collaboration with the assistance of external research organizations such as the UWI Engineering Institute and CARIRI, as required.

Finally, encouraging and, in some cases, mandating that companies in the private sector which invest in Trinidad and Tobago, support the country's research effort. I will come to that very shortly.

I agree with Sen. Prof. Kenny on one critical issue, that many of the so-called research institutes in this country are evolving into consultancy services rather than doing proper research. I totally agree with him. I also totally agree with him when he says that the research effort in this country is far too fragmented, and we must have a more unified approach to research. We in the Ministry of Energy and Energy Industries have been pursuing a number of initiatives in respect of research and development and I am pleased to inform the honourable Senate that some of the measures adopted today, are aimed at promoting science and technological development in this country.

Most of the petroleum companies in Trinidad and Tobago now are operating under production-sharing contracts, 13 of which were signed from 1996 to the present. In addition to a number of commitments and obligations, they are required to fulfill financial obligations with respect to research and development.

Over the period, 1996 to 1999, we have accumulated provisions for training and research development in a special Research and Development Fund in the Ministry of Energy and Energy Industries of TT $50 million. These contract provisions are really self-sustaining, in that, following commercial discovery, the annual contributions to research and development are increased. In addition, provisions are made for scholarships and technical equipment bonuses which are used for scientific research and development. As I said before, we need to provide the infrastructure which allows for scientific research and technological development. The country must, at all times, have a highly skilled, highly motivated and highly educated workforce which would allow for scientific research and development. That is what I mean when I say that we must have the infrastructure in place to facilitate scientific research and development.

From September 1998, a total of 23 scholarships were offered to nationals of Trinidad and Tobago at both undergraduate and postgraduate levels in fields of study appropriate to the petroleum industry. This was stated in Cabinet Minute No. 1514 of June 10, 1998. We had wide-level consultations among the various ministries: the Ministry of Public Administration; the Ministry of Planning and Development; and the Ministry of Energy and Energy Industries to determine, *inter alia,* the appropriate mix of scholarships, that is, the fields of study and the relevant graduate fields of study which we must undertake. The fields of study were informed by a list of national priority human resource needs identified by all ministries and collated by the Ministry of Planning and Development.

2.50 p.m.

Mr. President, we have a breakdown of some of the scholarships which were offered:

"Name of Companies	**Block**	**No. of Scholarships**
British Gas/Deminex Trinidad Petroleum/ Agip Trinidad and Tobago Limited	Block NCMA1	two (2)
Exxon Exploration Production Trinidad Limited	Block 25b	two (2)

Exxon Exploration Production (Deepwater) Limited	Block 26	two (2)
Trinidad Shell Exploration and Production/Agip T&T Exploration	Block 25A	seven (7) annually during exploration
British Gas Trinidad Ltd./Texaco Trinidad Inc.	Block E	one (1)
British Gas Exploration & Production/Texaco	Block 5A	two (2)

Mr. President, this gives you an idea of the scholarships which are available annually to Trinidad and Tobago nationals, arising out of the efforts of the Ministry of Energy and Energy Industries.

We have focussed significantly on providing the infrastructure required for scientific research and technological development, and it is almost axiomatic that to provide a climate of scientific research and technological development we must have a highly computer literate society. We have succeeded through the Ministry of Energy and Energy Industries in outfitting 85 out of 103 secondary schools in Trinidad and Tobago with fully equipped computer laboratories, fully Y2K compliant. In that regard, we probably have the highest number of students in the Caribbean who are now doing the Caribbean Examinations Council (CXC) examinations for information technology.

As we have seen the results in the newspapers, CXC information technology has the highest pass rate of all subjects, as far as Trinidad and Tobago students are concerned. Not only that, but we are now offering at the adult education classes level—we have offered to every Member of Parliament in this country in the 36 constituencies, the facility of having computer education on an ongoing basis, virtually free of charge.

As we are all aware, also through the efforts of the Ministry of Energy and Energy Industries—[*Interruption*]

Sen. Prof. Spence: Just a slight correction, Mr. President, there are 67 Members of Parliament not 36.

Sen. The Hon. F. Gangar: Thank you, Prof. Spence, I accept your correction. I meant the 36 elected representatives of the Lower House. I note your correction.

As I was saying, Mr. President, we have also distributed over the last 18 months 1,000 Y2K-compliant Pentium computers to 167 schools in the country, which has gone a long way in alleviating the computer problems in this country.

Dealing again with the infrastructure for technological development, we have established a very successful model for technology education in this country, which has won international acclaim, that is the National Energy Skills Centre. Again, this was generated out of investments made in this country, where people who are investing in Trinidad and Tobago are mandated to contribute significantly to the educational development of Trinidadians and Tobagonians. So far, out of this fund, we have been able to collect TT $70 million, which we have placed in a trust that is being used now for the technical education of people in Trinidad and Tobago. This is to ensure the availability of a skilled human resource base, thereby enhancing the country's competitiveness and attractiveness to investors, and reducing unemployment.

We have introduced many new state-of-the-art technology methods in the national training system. For example, we are using prior learning assessment and recognition, which people use to train and assess the capability of trainees, and since training activities started at the centres in February 1998 we have trained more than 1,000 graduates with a success rate of over 90 per cent; most of them have been involved in well-paying jobs.

Another major initiative, Mr. President, of this Government as it relates to technology development and scientific research in Trinidad and Tobago, is the soon to be established Trinidad and Tobago Institute of Technology. I have had many discussions on this matter with my distinguished academic colleagues in this honourable House: Sen. Prof. Spence, Sen. Prof. Kenny and Sen. Prof. Ramchand, on the implications of having a Trinidad and Tobago Institute of Technology. It is in some way connected with the National Technology University, which Sen. Prof. Kenny has mentioned on numerous occasions, and the Government is proceeding along the lines of setting up a Trinidad and Tobago Institute of Technology.

In fact, Cabinet last week approved the final proposal to proceed with the Trinidad and Tobago Institute of Technology. This Institute of Technology will be established at Point Lisas, Brechin Castle to be exact, and it will be a major boost to scientific research and technological development. The need for this centre was identified by a survey which was done. On the basis of this particular survey, it was found that there was a shortage of training at the technical level to satisfy current and projected requirements of local industry.

The need was further accentuated when it was recognized that more than 50 per cent of existing personnel at the middle and upper levels of industry possessed only the craft level or lower qualifications. This has been considered to be grossly inadequate to support our present industrialization thrust. The quality of the workforce to be supervised and managed and the increasing sophistication of technical and management systems dictate that we have a higher level of supervisory staff.

Mr. President, the Trinidad and Tobago Institute of Technology will offer, among other things, a two-year diploma in technology and a four-year bachelor of applied technology in all engineering disciplines relevant to the local industry, petroleum, chemical, process, mechanical, electronic and electrical engineering. It was found that there was a major gap between the technician and the engineer and there is need for what is known throughout the world as a technologist. At this point in time, the full detailed engineering designs on the building are in progress and the entire facility is expected to cost in the region of TT $100 million and is to be completed, hopefully, in the year 2000.

The institute will be equipped with state-of-the-art laboratories suitable for training in current and emerging technologies. Staff will include experienced industry personnel who would utilize curricula developed by various advisory committees. In order to avoid duplication and achieve more efficient use of resources, the institute, operating under the purview of the National Training Agency, would ensure alignment of its programming with the rest of the national technical and vocational systems of education. It is hoped that the Trinidad and Tobago Institute of Technology, as it would be called, will be self-supporting in meeting its operating expenses from companies and students' fees. That is a major policy initiative of the Government of Trinidad and Tobago as it relates to scientific research and, particularly, technology development.

We are looking also at research projects. As I said, we have a research fund of approximately TT $50 million. I said earlier in my contribution that we have to look at the pros and cons, the negatives and positives of pure research, applied research and relevance of the research. We have scarce resources; $50 million may sound like a lot of money but the demands are numerous. So we are looking at supporting energy research projects which would have a direct bearing on the economic fortunes of Trinidad and Tobago and also some of the environmental aspects of preserving our environment. We are looking at major studies with respect to the design of a modern off-shore fabrication facility in Trinidad and

Tobago, which would severely minimize the drain on foreign exchange for the building of off-shore platforms for Trinidad and Tobago's petroleum thrust.

We are also looking at the establishment of a catalyst research and development laboratory at the University of the West Indies. This will be a joint effort by the Ministry of Energy and Energy Industries, Petrotrin and the University of the West Indies, which will seek to establish a catalyst research and development laboratory designed to facilitate the growth and development of the domestic refining industry.

The specific technical objectives associated with the operation of the facility will include the provision of support services to the oil and gas industry in the areas of catalyst testing and evaluation, and quality assurance. As many of my colleagues are aware, catalysts are extremely important in process operations in the petroleum industry. It is, therefore, imperative that we be at the forefront of technology in this area and at all times. There is a clear need for the provision of relevant support and research services to help move the industry forward.

Mr. President, we are also looking at another project, this is with respect to—I am sure Sen. Prof. Kenny and Sen. Prof. Spence would be happy with this one—the remediation of petroleum contaminated sites. We have one of the oldest, if not the oldest, petroleum industry in the Western Hemisphere dating back to 1868, and over the last 130 years many areas of our country have been contaminated with petroleum products. What we are seeking to do in this major study is to address problems caused by pollution by petroleum companies, and we will seek to evaluate remediation techniques applicable to petroleum contaminated lagoons; to evaluate available technologies for remediation of specific petroleum contaminated terrestrial sites; and to build institutional capacity at the University of the West Indies and Petrotrin to develop a local resource base with proven capability to address such problems in the future.

We are also considering a third project—an investigation in the use and performance of progressing cavity pumps and the potential for refurbishing, designing and manufacturing them locally. This will go a long way, we hope, in making more efficient and more economical production from some of our older oil and gas wells.

3.05 p.m.

Mr. President, we are operating in a multifaceted way; we have a multipronged strategy with respect to the development of scientific research and

technological development in the country. Particularly so, we have a renewed focus and thrust in the energy sector in Trinidad and Tobago. We have gone further in many other ways. As Sen. Prof. Kenny has said, we have spent a considerable amount of money with the help of others in developing a comprehensive, authoritative, geological map of Trinidad and Tobago which now serves as an industry reference for the geology of our country.

As part of our negotiations for the sale of the Trinidad and Tobago Methanol Company in 1997, we instituted a chair in petroleum engineering at the University of the West Indies which had to be funded by the purchasers of Trinidad and Tobago Methanol Company as part of the purchase price for this particular company. We have now hired a renowned professor in petroleum engineering who is working at UWI and now holds the chair in petroleum engineering there. It is being funded at an annual cost of US $150,000 which allows us to pay the professor's finances, research, and a few research assistants and we hope to see some results from this particular chair very soon. I say no more at this point in time.

We also have ongoing negotiations with other investors in the energy sector, and we hope to negotiate a similar chair for a world-renowned professor in environmental engineering at UWI and again we expect results.

We would also be looking at alternative uses of energy with particular reference to Trinidad and Tobago, particularly so for Tobago where, notwithstanding our very abundant supplies of hydrocarbons, oil and gas, sometime in the far distant future, it will be exhausted and depleted and we will have to rely on alternative energy sources such as solar, wind and wave and we intend to start some complementary research work in these areas.

Also, one of my pet research projects will be to find some proper downstream uses for our asphalt which, I have consistently maintained although it was discovered 400 years ago, we seem not to have found the optimum use of such a valuable resource.

Mr. President, as I close my contribution on this particular debate, I hope I have enunciated some areas of Government's policy as it relates to scientific research and technological development in the broader context of Trinidad and Tobago, and within the specific reference of the energy sector. Again, let me thank Sen. Prof. Kenny for bringing such a relevant and topical Motion to the attention of this honourable Senate.

Thank you very much.

Sen. Prof. Kenneth Ramchand: Mr. President, I am happy to speak on Sen. Prof. Kenny's Motion. The Government of Trinidad and Tobago has expressed an unprecedented interest in spending on technology, training, and skills development and if the Government is really so interested, then Sen. Prof. Kenny's Motion is a timely one and one that is quite radical in its implications.

I would leave aside, for the time being, the question of how this thrust, which we can describe as one towards training and technology, relates to the larger question of education. I will leave that question for another occasion and I will also leave for another occasion the even larger question of what is the meaning and purpose of education and of the intellectual life of the region.

Sen. Prof. Kenny's Motion takes it for granted that there is a connection between scientific research and technical innovation, and I think everybody agrees that there is such a connection. I think Sen. Prof. Kenny's attempt to make clear the difference between research and technological development, and yet at the same time, insist upon the connection, is something that the country should listen to.

According to Sen. Prof. Kenny, scientific research makes a contribution to scientific knowledge and technology is the application—unfortunately not of all that knowledge—of selected aspects of that knowledge to deal with particular problems or issues that are of interest to the country where the research has been done or is available. So you find out that asbestos is resistant to heat—a little knowledge is a dangerous thing—so you use asbestos to roof your schools. So the technology was based upon knowledge, but it was not taking all the knowledge into account. You play around with the atom you split it, and some fellows make a bomb. A man does research on the atom, and another decides to make a bomb. You offer a prescribed list of books and a man makes a "boo". *[Laughter]* Excuse me, Mr. President, I promised not to mention this subject again that is why I dropped off the letter "k" at the end.

Sen. Prof. Kenny's Motion, as I said, assumes the connection between scientific research and technology. The technology emerges out of the research, but one of the significant points implicit in the Motion is that the research and the technology are either happening in the same place, or being done by the same person or that the same team is carrying out the research and the technology. What I am about to say is not exactly a joke, it is just an absurd example. You could send the Postmaster General to New Zealand to find out how they carry the

letters around from post box to post box and whether they use snow plough, ski, or van and so forth. Then the Postmaster General could come back here—having studied, and done the field work on how the New Zealanders do these things—and run the post office. That is one way in which the research happens over there, and the application happens down here.

On the other hand, you could send a team of people to some country that grows chickpeas, let them spend an agricultural year there, study how the chickpeas, dhal or channa is grown. You choose a country with a climate reasonably like ours, let this team spend the year there, then you bring them back to Trinidad and Tobago and give them the facilities and if they are going to give away Caroni (1975) Limited, give them a piece and tell them that within five years' time we expect channa to be growing in Trinidad. Again, this is a case of where the research is done in one place and the technology is applied in another, but you have decided what is the research that is going to be done overseas, so it is the same team who is doing the research and the application.

I think that is a very important connection that the research and the technology would be either done in the same place, or by the same team and the purpose of that is to make sure that the research and the technology are directed towards, not just economic and social development, but sustainable economic and social development. The Motion in other words, is asking, among other things, whether the Government wants to encourage scientific research within the region that could lead to technical innovations calculated to solve problems specific to this country and its people. That is one of the major appurtenances to the present Motion.

Mr. President, many times the air-conditioning system—and especially just before examinations—at the University of the West Indies breaks down. You say to the librarian: "Why do you not get people from the engineering faculty to fix it?" They cannot fix it, they do not know how to fix it. That is one thing. Then they say: "We can't really interfere with that you know. It was a gift from somebody and we don't know about the spare parts, where are we going to get the spare parts." Mr. President, it takes about four months to get the spare parts by which time the students fail their exams, or they sweat to death. The spare parts arrive and the technician has to come from Puerto Rico to get the air-conditioning system going. Why is a country like this not a leader in technology that has to do with air-conditioning and refrigeration? It would seem to me that if the University or any of the research institutes were to say we are offering scholarships, or we have a programme—you have to get a programme about air-conditioning and

refrigeration—and you link that with a programme in a science of materials, because maybe there is material in the environment that we can use in the refrigeration and air-conditioning projects. You set that up and you know, this is not just training in how to make a refrigerator, you are teaching people refrigeration and air-conditioning. There is much physics, chemistry and mathematics involved so nobody could say that you are prostituting your university to produce technological things that you need immediately. This is science! You are doing pure science even while you are doing a project that can be applied to the development of the country.

I would like to hear the Government announcing they are going to choose three scientists who have some experience in petroleum products. We want to know what to do with this asphalt. First of all, we want to know how can we use the asphalt here and how could we find a good form to export the asphalt in.

3.20 p.m.

I do not think that is a non-academic project. Such a project will involve somebody in really pure science, which he will then have to apply to this major problem that we have, so that the Minister of Energy and Energy Industries would not say, "I might have to sell Lake Asphalt". But he will say, "Yes, we have people working on it and there are pure scientists who are producing knowledge that will help us to make Trinidad Lake Asphalt viable." There are many other relevant projects that involve us in both pure science and in technology at one and the same time, which I feel that the Government and our research institutions should champion.

I know that in my own field, if I am teaching the novel *A House for Mr. Biswas*—and I did promise not to mention Biswas again—I am also teaching how to read novels. So, the student who has come to me, and who has gone through *A House for Mr. Biswas* with me, will not only know about *A House for Mr. Biswas*, he will know how to read "a house for Miss Mc Kenzie", or he will know how to read, *Top Guns Never Die*, whatever it is. I have taught him how to read novels. So I have done a scientific thing and also, a very technical, appropriate and immediate thing.

Mr. President, I wanted to let him see how *A House for Mr. Biswas* is tied up with the evolution of our country and with the formation of a Trinidad and Tobago identity. I want him to see that but I also want him to learn how to read novels, so that when he leaves me, he will not ring me up a year later and say, "Doctor, you teach us *Biswas* but they change the book, they are teaching a

Brighter Sun now and I do not know what to say." *[Laughter]* I have taught him how to read novels and I think the same thing applies in relation to science and technology.

So, I cannot insist too much that there should be no divorce between science and technology. It is perfectly possible in our institutions to carry out pure science projects that are also projects with a high applicability and practicality factor. If we were to take that approach, I think we would be making not only a major contribution to learning, which is what research does, but a major contribution to sustainable social and economic development.

There is another aspect of the Motion that I would like to refer to because when I think about it, the Motion is asking us, what do we do about the situation that we import more and more technology and find ourselves at the mercy of technical experts and suppliers of spare parts from abroad? We remain dependent upon the research that has been carried out elsewhere and is not readily available to us. I have already given one example of that—the University of the West Indies air-conditioning system.

Mr. President, I am very worried but I am glad that we are planning for a computer in every home; a computer in every business—several computers—and computers in every school. If we do not embark upon some very high level studies in computer hardware and software, in four years' time, we may have slid past Y2K all right but we are going to have a whole set of computers breaking down; a whole set of programmes being irrelevant and we will have to put our hands in our pockets and we repair the computers twice and then buy a new one, and then still remain at the mercy of those who are making us buy them. It is so sickening. Every time you open up your computer, they tell you, "em, em take an upgrade, take an upgrade, you could buy the upgrade on-line." You are going quite happy with your thing and working well with your old computer but they are "jookin" you, "take an upgrade, take an upgrade." If you have a son who is in the business he says: "Dad that thing is primitive boy." *[Laughter]* I had a Kay Pro computer; my son walked in and said: "Dad that is stone-age computer." I buy a Mc Intosh SE, he comes to me and says, "Dad what are you doing with that?" *[Laughter]* I buy a Power Book a year later he comes and says, "Dad they have a 1400 now, you know." I buy the 1400, he says, "Dad what about the G3?" I buy the G3 and he comes and says now, "What about the G4 Dad?" We are all caught up in that fever. It is only out of ignorance that I keep deciding that I have to keep up with them. I have to upgrade, upgrade, upgrade and I am going to Mac 'O'

8.1, 8.5 and so on, and every day I am looking on to see if they have another Mac 'O' for me to upgrade. *[Laughter]*.

Mr. President, ignorance is a very dangerous thing. We have to make sure when we are importing these computers and programmes. We should have people developing our own software industry. That is where the research has to go and that is the kind of technology that would come out of it and we could sell our software as well. So, first of all, we should try to make sure that we develop our own software. Every programme that I have bought has about 50 per cent irrelevant stuff because it was not devised for us. So, this is a problem that Sen. Kenny's Motion is asking us to think about.

Mr. President, it has another implication. A young man came to this country and started to work with a computer firm. They were glad for him and he brought in all kinds of new systems for them. He had a lot of knowledge and was well up with the technology. He set them up nicely and then they settled down into a formula. They are now selling a certain kind of hardware and software and they cannot afford to change now. So, this man whose knowledge they had used, they are looking to him and saying, "Boy every day you just going on the computer and checking out what is happening, but you are not bringing in any real work in this place. You better start selling some stuff for us and you better start selling some systems." So in the end, somebody with knowledge and with the technology in our environment is reduced to being a salesman. That is not the kind of atmosphere within which we should be developing our interest in computers. I just had to tell this young fellow: "Boy, go, emigrate, go to England and suffer, it will do you good. You could stay here and be king because one eye man is king in blind man country, but go to England and suffer." It is better to be Socrates discontented than a pig satisfied. *[Laughter]* When you have to talk to your children like that it is not nice.

Mr. President, I have a vested interest in our having an environment where young people who want to pursue research can feel that they are encouraged to stay here and do their research and do relevant research that will be of benefit to the country and will allow parents to see their grandchildren.

So, Sen. Prof. Kenny's Motion asks us to look at our abject dependence, on imported technologies and on applications not devised for our situation. It asks us to look at our unwillingness or inability to modify and adapt those technologies and to recognize that we are in that position because we are not doing the

research. I spend hours or weeks and days, when something goes wrong with my computer, fiddling to get it right. When I get it right and the thing goes wrong the next day, I do not know what I did to get it right the day before, so I spend another two weeks. Sometimes I do not get it right and I get a hammer and want to bash in the computer. I ring up Mark Lyndersay or I ring up my son in England and ask him and in two minutes I am told what to do. Knowledge, Mr. President, the result of research. I have not done any research in computers. I could just twiddle. I think we are a nation of twiddlers of other people's technology. I have already asked, what is going to happen when those computers start to break down and the software is obviously irrelevant and inappropriate?

3.30 p.m.

Now, there is another aspect of Sen. Prof. Kenny's Motion where he does leave an opening, and I do not think it is accidental. He tells us that he is dealing with science and scientific research, but he also says that the social sciences are a science too and, by implication, the humanities are a science too. What we have seen developing in the modern world is that in nearly every field or discipline there are technologies, and these technologies come out of research and the accumulation of knowledge. Years ago, if I wanted to examine, let us say, spider imagery in a novel, as I did, by a Guyanese called Wilson Harris, the process was very involved.

He uses spider imagery, Mr. President, because he is concerned with the "Anancy" or trickster figure which is a figure of transformation. He is writing about how West Indian societies have to develop the skills and guile like "Anancy" to transform themselves and their own environment. So the "Anancy" figure is there floating around in the work and the "Anancy" imagery appears all over. So I want to examine this spider imagery and I start by marking off all the references. So I look for web, spider, trickster, ray, thread, filament, mask, roll, lint, finger, gossamer—in the end I get a big list.

Then I have to read this book page by page with this list beside me. I then have to underline the words and write out the sentences where these words occur so I can do my analysis afterwards. Mr. President, all I have to do now is just scan the book, put it on the computer—because I cannot type fast—and tell the computer, "Every time you come across any of these words, just pitch out the sentence for me and tell me what page it is on". So even in the humanities there is

the need for research and the awareness of research and the application of technology.

Sen. Kenny pointed out that at the University of the West Indies the output in the science faculties, with one or two exceptions, is pretty low. I do not know if he said it but he certainly told me, and his charts show it, that the output in humanities is probably highest. We have produced more Ph.Ds. and more M.Phils. at less cost than the other faculties. We have to ask, Mr. President, why is that? Well, I think that it is not that these are soft options but—let us see how I can put this without involving myself in it directly—ever since the University of the West Indies started teaching Caribbean literature, a focus was found for students to do graduate studies and to see the relevance of literature to society, to psychology, to history, *et cetera*.

So once we established West Indian literature as an academic discipline, and once we gave the reasons why that discipline was important to us, that it was a discipline—I know when I first started to teach it senior members of the university used to come to me and say, "Mr. Ramchand, are you sure we have enough books to have a whole course in West Indian literature?" And, "You think it good enough? You think the people in England and America will regard these—is it universal enough?" I said, "Well, they did not ask me that question when I was teaching it in Edinburgh or in Warwick or in Canterbury. They did not ask me if it was good enough or if "it had plenty". They were glad to do it. So why should the University of the West Indies query it?

So we started it and we showed the relevance of the literature and we have shown the relevance of many other disciplines in the humanities. Many of the economic policies of Caribbean countries relate to or derive from the work of social scientists at the University of the West Indies. In thinking about research and technology I feel we have to broaden our understanding of what is science because sometimes I believe I am a scientist. When I am doing my literary analysis I am a scientist. When somebody is doing his history I think he is a scientist too. We can have the scientific approach and we can seek to apply our knowledge to the problems of the society in the social sciences and in the humanities.

So Sen. Prof. Kenny has left the opening for us to say that although he is asking about scientific research and technological innovation, he is talking about all research and technical innovation in the society. It is obvious that, even within science and technology, management is now a technology; dealing with money is now a technology, and if you look at the number of consultants and foreign

experts who are being brought into the country to run things and give advice about how to set up things and so forth, you would see that what we need to do is to breed our own experts in these fields as well. Cut out these middlemen, cut out these people who have to come here and learn about the place before they can develop an appropriate technology for us. We have people who live and breathe this place, who know what is needed. These are the ones whom we should train to do the appropriate research so that they can have the tools to work in our expanded technological field.

So, Mr. President, one of the things that Sen. Prof. Kenny's Motion raises, and Sen. Gangar recognized it, is that there is a very strict connection, or there ought to be, between research and technological innovation on the one hand and a country's social, economic and cultural policies. Now, the people in the research institutions, the people who are involved in research programmes, must have some relationship to Government policy. I do not want Government to come and tell the research programmes, "All you have to do is so and so and we want you to stop teaching X and do Y". What they could say is, "We are giving additional funding for the carrying out of Y. So we will allow you, if you have somebody who is interested in the tragedy of Albert Einstein, why Einstein turned to God after all his great scientific research—he did not eh, that is not true—but if you have somebody who is interested in that and you can find your funds to let him do it, let him do it but we want you to do something about petroleum and we are giving the funds for it". That is a kind of piecemeal way of doing it.

I was, as usual, playing around on the computer when I should have been doing my work, and I stumbled upon something called the State Science and Technology Institute. So I clicked and found out a number of things about it which gave me an idea of the kind of thing I believe we should do. It says that the State Science and Technology Institute is a national organization dedicated to improving government industry programmes that encourage economic growth through the application of science and technology. I repeat; a national organization dedicated to improving government industry programmes that encourage economic growth through the application of science and technology. It goes on to tell us about the SSTI's involvement in information, education, research and facilitation.

They run a magazine—by this time I am getting very, very "farse"—so I decided to see what their magazine contains. In the August 13, 1999 issue—and I have to confess ignorance because I found this out only on reading this—a man

called Neil Lane has a job of being the President's science adviser and he is also director of the White House's Office of Science and Technology Policy. So I am wondering, Mr. President, whether we can begin to solve some of the problems that Sen. Prof. Kenny was talking about, and they are problems of jurisdiction, by setting up an office of science and technology policy with a science adviser to the Cabinet as one institution. And then set up—I hope I would catch Sen. Gangar. I wish I knew whether he drank or something so that I could get him drunk and talk to him. If we could change the proposed institute of technology to the technical university of Trinidad and Tobago and if we could work towards that, I feel that we would be on the right track.

At any rate, if you have this office of science and technology policy, then you can set up the technical university of Trinidad and Tobago. You need to set that up because I am not convinced, even from Sen. Gangar's account, that we are really, by means of the institute, co-ordinating all the technology research programmes and institutions in the country. I am not sure that the technical institute, as proposed, will do that. It will be one among many. What we do need is a master institute, like the technical university of Trinidad and Tobago, one of whose jobs would be to set up a hierarchy between these different programmes and institutions and say, "What you are doing is really like a sixth form college; what you are doing is like a two-year diploma; what you are doing is a three-year degree; what you are doing can become an M.Phil. or a Ph.D."

The technical university of Trinidad and Tobago will establish that hierarchy, it will set up an order of priorities in research projects, it will co-ordinate the different efforts and it will avoid the duplication. These are many of the problems that Sen. Prof. Kenny is pointing to, that we have so many of these institutions, we do not know what they are doing and we are sure that they are duplicating one another's work. So we have this office of science and technology policy, we have the technical university of Trinidad and Tobago, and we go to UWI and say, "Brother, you've got to slim down".

There are certain things that the University of the West Indies will do in science and technology but it has many other things to do. The University of the West Indies cannot be reduced to being a technical institute. A university is a place of higher learning. I would still regard it as the supreme intellectual centre of the place and it would be interested in pure science but it would not be as responsible for the technological thrust as a technical university of Trinidad and Tobago. It will be there so that if the "fellas" in the technical university of Trinidad and Tobago are working in a glorified science lab and doing rubbish, there would be an authority there that knows

about pure research; there would be a group of their peers who are telling them, "You are doing a lot of unscientific rubbish", so there will be liaison between the adjusted—UWI and the technical university.

Mr. President, I could tell you, one of the reasons the University of the West Indies has under-achieved is that it has had to overexpand and overdiversify to satisfy all the higher educational needs of a growing population. It really needs to become leaner and more oriented to certain higher education goals, and the technical university of Trinidad and Tobago will free up the University of the West Indies to make us prouder of it than we are.

3.45 p.m.

Now, I know Sen. Prof. Kenny is proud of the University of the West Indies. He is critical of it and I am critical of it, too. At a certain point in my relationship with the University of the West Indies, I stopped giving them any list of my publications, or any list of my activities, because I felt they had delayed my promotions too much. I had to do twice as much work as anybody else and I had to wait twice as long to get a promotion. So, why should I give them my publications? I have never given them.

I told them, "I do not serve you guys; I serve the idea of the university. I do not serve you guys; I serve the young people who come in here to be taught." And I just turned my back on them and their bureaucratic ways. You know how academics are. Everybody is like that; they do not like to see you strive.

Mr. President, I am proud of the University of the West Indies and I know that Sen. Prof. Kenny is proud of it, too, and when he is critical or I am critical, what we are really saying is—and this is from one of the columns I wrote years ago—we have another chance to create a real university.

Let us think about that three-tier thing about which I am talking: an office of science and technology policy; a technical university of Trinidad and Tobago and a slimmed-down and streamlined University of the West Indies. The existence of an office of science and technology policy recognises that the Government is saying to the institutions, "We know we have certain policies and certain priorities, but we also accept that you must have a certain amount of intellectual freedom; that you are in the business of education and you are not there only as a service institution to help us achieve our policy goals. We want your help, but we recognize that there are other educational interests."

That is another thing that Sen. Prof. Kenny's Motion is concerned about, the balance in the educational system and the balance in tertiary education between research, technology and teaching. Every one of our tertiary institutions should have those three components, but the components would vary. If it is the technical university of Trinidad and Tobago, you would have more technology than pure sciences; if it is UWI, you would have more pure sciences than technology, but every one of them has to be committed to teaching, to research and to the practical application of research.

So that even if the University of the West Indies has to adjudicate between two proposals for research, knowing that funds are limited, it would have to say: This project here is more likely to be funded than that one there, because this project, where you are proposing to study the life cycle of the mosquito and to see whether, in connection with imputs from environmental studies and landscaping, you can help us to eradicate the mosquito problem. If you are going to do a Ph.D about how to get rid of mosquitoes forever and ever, or for the next 20 years, obviously, your biological studies or your studies of the life of insects, *et cetera*, will be something that we are more likely to encourage, than something that does not have that kind of relevance.

Incidentally, Mr. President, if I set up my own university, the first thing I am going to do is, get a team to develop the technology to grow channa and another to do the research to get rid of mosquitoes.

But the point I am trying to make is that these tertiary institutions cannot be single arrow institutions. They will all carry the three arrows in their quiver, some will have more research arrows, some will have more technology arrows and some will have more teaching arrows; but teaching depends upon research; technology depends upon research; research depends upon teaching and technology.

If I do some research and I find out something, I am really bursting to get to a class to say, "Listen, I told you I was going to lecture about Lamming today, but look what I found in a newspaper called the San Fernando Gazette of 1903. Look at this." And I will go into it with them because I am very excited, but that knowledge, that thing I have just discovered will just die inside of me if I cannot present it to my students, talk to them about it and help them to see their world slightly differently from this discovery I have made.

I end by repeating how important this Motion is and to restate the suggestion that, at bottom, what the Motion is calling upon us to do is to reintegrate the

tertiary education sector and co-ordinate our research programmes and research institutions, all with the aim of sustainable economic and social development.

I have much more to say but I believe the relationship between Sen. Prof. Kenny's Motion with which we are dealing and on which I am focussing in relation to the tertiary level, also has in it something about curiosity, creativity and maintaining that spirit in our people. It is something that I would want to take into another debate about what education is and what education is for.

Thank you.

Sen. Dr. Eastlyn Mc Kenzie: Mr. President, let me also congratulate Sen. Prof. Julian Kenny on this Motion. I take the very simplistic view of the implications of this Motion and I start with the education system at the schools, to say that I think we should encourage scientific research and technological innovations from the primary school level.

It brings me back to our own childish, playful ways where we, as children, invented a number of things. Little did we know at that time, how much we were using the principles of physics, chemistry and biology in what we were doing. Very recently, within the last few years, I know that the Ministry of Education had what they called the Yapollo exhibitions which they brought out into the districts. I say that groups like "Environment Tobago" incorporated the secondary schools into their water watch and published the results and the children were actually involved in that type of research with the waters in some of the bays in Tobago, having them tested in the laboratories at WASA and these places; publishing the findings and how much that alerted the Government and the Tobago House of Assembly to what was happening as regards pollution in the bays around Tobago. So, we have had our own experiences.

But, Mr. President, if we go back to our childish, playful ways, we would remember how, as children, we made our tops to spin. We did not have these fanciful things that they have now, but our research told us what type of wood was the best wood to make the tops; what size of nails; what length of string; it was scientific without us knowing it. We did not know the physics in it; probably somebody else understood, but we knew if you wanted a real sound top that when somebody gave your top a "zoong" on the head, it would not split in two, the best wood was guava. I am certain the hon. Minister of Tobago Affairs would know that. It was sturdy, it was hard, it was tough and it withstood whatever bounce your four-inch nail could have put on the head of that top. We knew from what

height you could spin your top to get a real top so that your top used to sleep and dance for a long, long time.

I think that was research and science in play that, at another time, your teacher in your class could have explained to you what law of physics you were using. It sounds as if it is play and as if it is frivolous but, probably, there is where the love for science would have come into the primary schools.

A few years ago, we had a little thing in our church at Christmas time and they asked two of us who liked our drama to do something. My friend and I came up with an idea. I said, "Look, you walk with some modern day toys and I will walk with some old-fashioned toys." So she came up with something that was battery driven and I walked with our old-fashioned cotton reel where you had a rubber, a stick and a piece of candle. We made the edges of the cotton wheel jagged. So, I had my tractor and she had her toy that she bought somewhere.

The children in the church were amazed. They had never seen anything like that and wondered, "What is that nonsense that she has?" I wound up "meh" tractor; I put it down and "meh" tractor going. I say, "You take the battery out of yours." [*Laughter*] Her car stayed in one place. Every time my tractor stopped, I wind up "meh" tractor and "meh" tractor going. What I am saying is all we had to do was get "ah" piece of rubber, get "ah" cotton reel—your parents throwing that away when they sew—and we were using these things and there again, somebody could have explained the tension and all that; why you had the grips on the cotton reel so your tractor would not slide. You had all this.

What I am saying is very simple. Instead of highfalutin types of exhibitions and competitions we have, for Christmas time, why can we not bring back the old-fashioned toys and so forth with an explanation of the physics, why these things were working and how they were working? I am sure that we would be starting from primary school to put into our children a love for science and a love for inventions because after that, children started to invent and improve on the simple inventions.

4.00 p.m.

Mr. President, again, I have seen it among the nurses at our hospital in Tobago. They had to have a special type of bed where there needed to be some

sort of big weight for somebody with a traction. They did not have the facility. What did the nurses do? They got a Klim pan, put a stone, put a string, strung it up and made their own substitute for what was the real thing. That, again, to me, was an invention. It breeds in one that type of attitude to substitute and to use one's knowledge and skill of how things work to make an invention.

As children also, we used to make our mixtures and play doctor. It was chemistry at work. Why are we making the thing so difficult and so above our heads that we think it is something that costs so much? It is to create in the children a love to invent and to create that will grow with us as we get older. We cannot start to love to do research, invent and create if that curiosity is going to be stifled very early in school and we are not going to give the children a chance to create, make mistakes and be another Dr. Adoo. He was willing to invent by trial and error and everything else to find something that would keep the AIDS virus low down and to help with the poisoning by gramoxone.

The curiosity in that man probably started way back in Ghana. Nobody stopped him when he was mixing up his concoctions. His parents did not stop him at home and tell him he was messing up the place. The teacher probably never told him, "Boy, I am going to seize that cotton-reel tractor. You will never get it back again". In fact, the teacher probably must have said, "Tell me how that thing works". That attitude, that curiosity, everything developed and would bring one to a stage where one would not be asking and begging people to go into the area of research and technology.

Mr. President, just this week we read on the newspapers of the 72 or 82-year-old man with the soft candle machine that he invented and was making all sorts of things. We have it. We just have to encourage it. I am specifically keeping my contribution folksy to show how as children we were encouraged.

I remember that as children we wanted to play priest and we would get up on our parents' bed and take down the goblet and put it to our mouths and talk. It made us sound as how we perceived the priest sounded when we went to church, because he had this loud, resounding voice. We would go up there and put our parents' sheet around our shoulders because it was white, and we would go up on the bed which was our pulpit and we were preaching. We did not have voices as big as the priest, so we got the goblet, emptied the water, put it to our mouths and we sounded like the priest.

The parents could have come in and break up the whole church when they found us with the goblet, standing on the bed, but at the same time, they allowed that playful, creative attitude; that drama in us, so that later on we understood why it is when we talked in this thing, our voices got bigger. Who will explain that to us in physics? So, the creativity, Mr. President, is there.

In the secondary schools we could use the sciences to invent. We could have our little competitions to let our children invent, do research and discover. Here, again, chemistry comes in. We can also have research for preventative measures and, as the Senator said, to publish. Now, I will give an example.

Some years ago, I went to Charlotteville and I bought fish. I came home and I cooked my fish. I had a nephew living with me at the time. I went somewhere, and while I was there, somebody rang and said, "Your boy is at hospital." I then went to see what was happening and he said, "Aunty Eastlyn, I ate the fish, and a few minutes after I went back to school, I started to vomit."

I could not understand why, but I also ate the fish and soon, I started to feel sick. I could not imagine! So, I also went to the hospital. I threw out the rest of the fish, the cat ate it, and the cat vomited. I thought to myself that this had to be something. However, the thing was that the fish had eaten copper from some sort of wreck, and when I was relating this to a friend—obviously, because I was bigger than my nephew, my body withstood it more so, it took a longer time to affect me—she said that in St. Vincent, because there is a frequency with this type of thing happening, they put something in the water when they are cleaning the fish, and if it turns into a certain colour, they know that the fish has eaten copper. What I am saying is that we have that problem. I do not know what it was they put in the water. Probably somebody who has done chemistry could say. We could use that type of thing to alert people. How can I test it and prevent something like this happening? Probably from the research that will be done.

Mr. President, we have it all the time. There was a Christmas party and the apples that the person put in the salad turned dark. I said to her, "Why did you not squeeze some orange juice on it? It will keep its fresh colour". Then she said, "Tell me more about that. What reaction does this citrus juice have on something like this?" This is where the chemistry comes in.

Why are we making science and technology so mysterious. We have made it so mysterious that we believe only certain minds and certain levels of academic achievement could lead us into science and technology and research, invention and innovation. I am saying this afternoon that we should try to simplify the thing

and make children feel from a very early stage that they are scientists, they can create, they can invent, they can publish and so, as they grow older, this will be something as ordinary and as popular as anything else they do.

Mr. President, we have had our learnings also from our foreparents, especially in the folk area, that we do not even understand up to now and, probably again, our young minds coming up could tell us why we do certain things. For example, when our parents make "benne balls", if we do not parch the benne seeds and just put them in the caramel, after a day or two, it disintegrates. I asked, why does this happen? What somebody said is that if one does not take out the moisture in the benne, after a time when it joins with the sugar that one has turned into a caramel, that moisture gets in there and the whole thing disintegrates; it never stays firm and hard.

What I am saying, Mr. President, is that we can learn so much from these things. This is research. It does not have to be high, if you want to call it that. It does not have to be couched in language that nobody understands. I think this is what is going to cause us to encourage more and more people, ordinary people, simple people, to go into areas of research and invention and innovation that will contribute to the development of this country.

I want to ask Prof. Kenny, finally, to see whether he can find the research to give him the answer to tell me why our old people used to put a nail in the pot when they were boiling something that was very hard.

Thank you very much, Sir. *[Laughter] [Desk thumping]*

Sen. Cynthia Alfred: Mr. President, it is a widely held belief, especially among laypersons, that science relates and is confined to some vague area outside of their understanding. Something having to do with eccentric men mostly, in white coats, who peer persistently and consistently into microscopes and continually pour substances from one vial to the other and end up with potions of myriad colours which could not possibly have anything to do with real life. As for technology, well, that is something to do with space, maybe, making capsules or whatever to go to the moon or maybe even Mars. They are so very wrong, but then, they can be forgiven for thinking this because of the high level at which science and technology are usually placed.

Scientific research and technological innovation, as expounded by Sen. Prof. Julian Kenny in his Motion, have contributed immensely to social and economic development of human societies and continue to inform and direct the course of

people's lives worldwide. I have an article here that was presented by Prof. Kochhar of the University of the West Indies on December 15, 1997. He was talking about the teaching of science in schools and how the teaching of science should not be just theory, but it should be related to practical life.

He said:

"The discovery of radioactive materials and nuclear research has been used beneficially as a treatment for cancer and in power generation, whereas the same knowledge caused catastrophic suffering for the people of Hiroshima, Nagasaki and Chernobyl. Therefore, a primary purpose of science teaching should be to demonstrate the application of scientific knowledge to everyday life and to the social and environmental implications of scientific and technological development. Compared with traditional notions of science, modern science teaching should be driven more by societal needs than by theory. Therefore, scientific research is mainly channelled towards human and social ends, such as finding a cure for AIDS or developing new sources of energy, and the result is a complex set of interacting relationships among science, technology, society, education and human affairs."

Very true, Mr. President. What this Professor is saying here is that science must not be viewed as something that is unintelligible to the ordinary man. If the teaching of science—and it is out of the teaching of science that one would, perhaps, develop the love for research—were to be expanded to include not mere theory, but to use the scientific approach to deal with human relationships, then scientific research and technological innovation would be much more meaningful to the ordinary person.

The United Kingdom Department of Trade and Industry/Science, on the question of science and technology in a periodical called *Science & Technology* which was done in 1997—this has been drawn from the Internet—stated:

> "One of DTI's objectives is to make the most of the UK's science, engineering and technology, in particular by achieving standards of international excellence in basic science and maximising the contribution of S&T outputs to the UK's economic development and the quality of our lives. The Department is responsible both for UK Science Policy (through the Office of Science and Technology), and for promoting Innovation and adoption of technology by industry."

4.15 p.m

Here it is, Mr. President, in the United Kingdom it has been recognized that science and technology—that is science, technology, engineering and so forth—the objective is to achieve international excellence. The point has been raised whether any particular country should confine its scientific research and technological development to that particular country. The answer, obviously, is no! One has to reach out into the wider community and see what is happening out there and relate whatever discoveries they have, to those other countries.

After this, a committee was put in place. The council was invited, as recently as 1998, to undertake a review of departments' use of science and technology and to consider what lessons may be drawn for government's science and technology policy as a whole. It is interesting to note the key areas that received the largest amount of funding are the Ministries of Defence; Agriculture, Fisheries and Food; the Department of the Environment, the Department of Transportation, the Department of Trade and Industry and the Department of Health. Mr. President, later I will talk some more about some of these areas.

It was generally accepted that those areas and others—their use of science and technology—were to inform policy, improve delivery of services, including support for industry, and to get quality decisions on procurement.

According to Sen. Prof. Kenny's Motion:

> "…there has developed in Trinidad and Tobago over the past 3 decades a wide range of scientific research programmes and institutions associated with different sectors of the economy…"

Mr. President, this statement is absolutely true. For over those 30 years, the People's National Movement Government, during its tenure of office from 1956—1986 and 1991—1995, has given considerable thought to, and has put in place institutions whose primary goals have been to apply science and technology to their areas of operations in pursuit of solutions to developmental problems. We know that some of these institutions are: CARIRI, the Bureau of Standards, the Forensic Science Centre, the Institute of Marine Affairs and NIHERST; to name but some.

Mr. President, as early as 1975, Cabinet authorized a committee to put in place a National Council for Technology in Development. This council was put in place in 1975. I have a report of that council. Even as far back as 1975, the People's National Movement recognized that scientific research and technology

play a very important part in the lives of people. As has been mentioned before, scientific research is not confined to science alone, it is also extended and expanded to the humanities. As a matter of fact, science and technology have something to do with every facet of our lives; in the development of our lives.

In 1993, Mr. President, again under the People's National Movement the then Minister of Planning and Development, in his contribution on the 1993 Appropriation Bill, spent some time on science and technology, recognizing that the importance of these areas could not be over-estimated. He, however, noted that with the various institutions in place, there needed to be at that time, a rationalization of those institutions to make them more efficient. Because what was happening then—as Sen. Prof. Kenny said in his Motion—we have all these institutions, but because of funding for one thing and because of the diverse areas in which they operated, it was felt that there was need to draw these institutions closer in order to make them more cost effective but somehow also to improve the management systems.

The Minister then said that CARIRI was asked to operate separate cost centres for major activities so that there could be better management control in what they were doing. The Government then asked the Institute of Marine Affairs to take full responsibility for the co-ordinating, development and optimum level of exploitation of the marine's resources. Then, very interestingly, NIHERST was asked to be the focal point for the co-ordination of research and development and science and technology policy. NIHERST was asked to convene a meeting of persons with the expertise in these various areas and to come up with a policy to inform on what direction the science and technology should take. Out of that—that was in 1993—the Minister of Planning and Development made his contribution and spoke about NIHERST pulling together these other organizations and coming up with a policy.

In 1995 there was a Green Paper which stated:

"Republic of Trinidad and Tobago

Office of the Prime Minister

(Science, Technology and Tertiary Education)

Into a New Era…"

Mr. President, up to 1993 and beyond, the PNM government recognized the importance of science and technology. The next thing that was put in place was this Green Paper. It says:

"A Draft National Policy on Science & Technology for Trinidad and Tobago."

I just want to mention a little of what was said, that is, by the Office the President of NIHERST in March of 1995. He said:

> "This Policy document shall shortly be augmented by a specific Action Plan and Implementation Schedule which shall seek to translate the discernment elaborated herein, into concerted action and reform which shall allow the S&T sector to confidentially chart a new and determined course, into a new era."

You will recognize, Mr. President, this was in March 1995. Later in the year, this particular government went out of office. So, there was not much opportunity then to implement this particular policy.

4.25 p.m.

So, it would be interesting to know whether this present Government, taking cognizance of this policy, this Green Paper, would have, perhaps, taken some ideas from it and put certain policies in place. Because we are not convinced that this present Government has really done very much in the area of policies and priorities for science and technology, scientific research and technological development, hence the reason this Motion has been brought.

Mr. President, I now go to a very important paragraph here in the same Paper and it says on page 1:

> "The promotion of technological change as an agent of economic growth and international competitiveness raises significant policy issues. Among these is the need to decide whether technological change should be driven primarily through imports or more by the development and utilisation of indigenous technologies, resources and manpower. The evidence suggests that countries which have employed an intelligent mix of both approaches have been most successful."

Mr. President, if one looks at other areas, other countries, one would recognize that those countries have acknowledged that one cannot confine one's scientific research and technological development to one's own area, but there has to be a mix, going outside of the particular area.

In that respect, the then Minister of Planning and Development mentioned that in addition to whatever NIHERST and the other local agents would do, there were a

number of bilateral agreements with countries and technical corporations and these institutions were asked to begin to formulate a programme—not a policy—of how the then Government and these institutions could begin to utilize the bilateral agreements with Mexico, Brazil, India and China.

He spoke about continuing the role of education, especially in languages, and he mentioned then that the PNM government was concerned with the fact that we have neighbours right in Latin America and among our people very few of us could speak Spanish. So in 1994, when there was a Conference of Ministers of Culture in the English-speaking and Spanish-speaking Caribbean, one of the agreements was that we in Trinidad and Tobago would introduce into our primary schools the subject of Spanish and the Latin American countries would do the same for English, for obvious reasons; if you need to communicate, one must understand what the other is saying. We were told that this present Government was going to start the teaching of Spanish in primary schools in January, 1998. To date, I stand corrected, but if Spanish has indeed been introduced into the primary schools, we are yet to find out what sort of research was done, whether in fact, teachers were trained, because I know for a fact that in most of the primary schools, teachers are not trained in Spanish and, even if they were, there needs to be a retraining so that they would teach the correct thing.

I was rather disturbed when just about last week, a great-niece of mine who goes to a particular school came—now they have started the teaching of Spanish in that school, but I was disturbed because certain things she told me were not correct. I was very worried. I told her "such and such is not the correct thing", but of course, the teacher told them so. So, it begs the question: What research or what system has been put in place for the teaching of Spanish in primary schools?

I am looking at a document which says *Report from Minister of Education, Towards Creative and Productive Citizens for the Twenty-First Century, Eighteenth Meeting of the Conference of Heads of Government of Caribbean Community*. It was dated June 29—July 4, 1997, and held in Jamaica. Whereas mention was made about early childhood, about English, Mathematics, of Spanish in secondary schools, I note that there was no mention of Spanish in primary schools. That disturbed me because I got the impression that having said that Spanish was going to be taught in primary schools from 1998, that somehow along the way that intention may have been abandoned. So I think it behoves this Government to revisit the whole question of Spanish in primary schools because all of us are agreed, I think, that we need to have the children learn that second

language from early. So why there is no mention of Spanish in primary schools, I would like to know, because that has me rather disturbed.

Mr. President: Senator, I do not know how long you would be again, but if you are winding up in five minutes or so, we will continue.

Sen. C. Alfred: I am almost finished, Mr. President. Thank you.

Now, Mr. President, health is one of the areas that the international community is very worried about. I have this document—I would not quote from it—*Annual Editions, Global Issues, 96/97*, and what it is saying is that in the area of health, everyone was convinced that certain diseases had been laid to rest. But here it is that there is a resurgence of certain killing diseases in the world: tuberculosis being the number one. I make the point because what this person who wrote the article is saying is that science is a continuing thing. Because you might have felt that you developed certain antidotes or whatever to the destruction of tuberculosis and other diseases, and here it is that so many years later, they have come back in real force.

So it is not only up to the First World countries. You know, Mr. President, when one talks of Third World, which to me is a stigma on countries like ours, I always ask myself: I wonder which is the Second World? So it is not only incumbent on the First World countries to develop new techniques in respect of the eradication of tuberculosis, but we in this country can do it as well. We have the resources and maybe, as was mentioned before, we are looking too high, maybe we need to come down. I am convinced that there is a cure for cancer and that it could be found locally. I am not a scientist. That is my theory, but I sometimes feel that scientists go so far in their experiments that they forget sometimes what they are really experimenting on. So I think it is time to go back to basics and see what needs to be done.

Finally, I would like to talk about computers in schools. Now, you know the Minister of Finance indicated that there would be computers in schools, certainly by the year 2000. Whereas there have been computers in certain schools, the distribution is very inequitable—for want of a better word—some have one, some have two, some have none and some have 20, and that in itself is not very good.

Again, with regard to the scientific approach to the teaching of computer science, what was said is that the computer teachers brought in would merely be computer literate, but it needs more than that. You need, yes, a particular teacher

or maybe two or three to teach that computer right through, but you also need hardware engineers, engineers who would see about the maintenance of the equipment itself. You need software people. You need to employ new people who would be able to prepare the software in the various subjects for the children. I have heard complaints that in most of the schools they are using the computers for games and I think that is simply because maybe the teacher's capability does not go beyond a certain point. I am sure the computers were not there just for games.

So it is proposed, or at least I would like to put it to this Government, that they look into the question of the use of computers; how they are going to distribute them; who they are going to use; establish your computer labs after people have been properly trained; and ensure that there is always someone to update the software so that the children, when they go to do Maths or English or whatever subject, the software is there for them to utilize.

So, Mr. President, according to the Motion, this Government has been asked to state its policies and programmes. I do hope that having said what I did, especially about the policies and programmes of the People's National Movement, that this Government will not lag too far behind, though I did hear the Minister of Energy and Energy Industries say that they must put certain infrastructure in place. The question is: When? They only have one more year. So, whatever they intend to put in place, they have to put it very quickly. I hope for the sake of the country, and for the sake of scientific research and technological development, that this Government moves expeditiously to ensure that the relevant information and systems are put in place so that this country will have an idea where it is going.

I thank you, Mr. President.

Mr. President: We will break for an extended tea break. This sitting is now suspended until 5.25 p.m.

4.38 p.m.: *Sitting suspended.*

5.25 p.m.: *Sitting resumed.*

Sen. Dr. George Dhanny: Mr. President, I think we owe a great debt of gratitude to Sen. Prof. Kenny for bringing the Motion that is before us. In fact, one cannot conceive of any modern society, making any progress whatsoever unless it is conversant with scientific research and technological development.

India is today one of the most scientifically advanced countries in the world because the Prime Minister of India, Jawaharlal Nehru, when he assumed office in 1947 said that in order to have a modern state there must be the substratum of

scientific competence and technological research. So that today, in that Republic of India, they are in a position—after 50-odd years—to export to all the countries of the world, including Trinidad and Tobago—the benefit of that decision that was taken at the time. So that Sen. Prof. Kenny is really knocking at an open door.

We are very grateful to the hon. Senator because he is talking about individual human curiosity and creativity and the yearning to search and investigate, which, in itself, is a worthy endeavour, and in order that human progress may be made possible, that curiosity and creativity is very important indeed.

We are, in Trinidad and Tobago, thinking in terms of becoming competitive in the international arena. We are thinking in terms of competing with some of the giants in the world, and I think this debate would signal a reminder to all of us that in order to compete we ought to be competent and that competence can only arise from one source, and that is our capacity to do the research and to develop the necessary technologies.

I do not think anybody can argue against the view that has been expressed that our technology ought to be indigenous. Even if we have to import it, and pay a very high price for it, very soon, after we have imported it and paid a high price, it becomes useless. The rate at which it is changing it becomes irrelevant by the time it is installed in one's business place or office.

One of the wonders, of course, in Trinidad and Tobago, is that we have a population—and I think we boast of it—with a literacy rate of over 93 per cent. I know that Trinidad and Tobago is blessed not only with natural resources but a great deal of intellectual power. We have people with intellectual capacity in this country who can compare with most and be better than many. The evidence is there. The question is, why has it become necessary for Sen. Prof. Kenny to bring a Motion like this before this honourable Senate? It is, as I said, to remind us that something is not right about the way in which we have been doing business.

We have been an independent nation for over 37 years, and by now, if we had a plan and a design, we should have been running easy and not worrying with this sort of thing. What has happened, in the absence of a plan and a grand design, is that there are a multiplicity of institutions and they have been using—as the good Senator has indicated—tremendous resources and yet they seem to be misdirected because, apparently, there has not been a national plan and a programme designed to achieve specific objectives. I think we are getting around to that now—something that one needs to have.

For example, as you know, there is a great move forward; opening up of markets and we want to compete and export things, and I often wonder how fast we can produce things. We cannot just produce things out of the air. How fast can value be added to some of the things that we have? How fast can we produce new products that we can export into these markets as they open up to us? Indeed, this is one of the big challenges that we have. How are we going to meet the competition? I agree that there is need for a co-ordinating council—whatever the appropriate designation would be—to conceptualize and to direct the vision, and to take the steps necessary and find the resources in order to achieve national objectives within a given time frame. What has come out of the debate so far is that there are many diverse bodies doing their own thing. If there is a mandate it would be for a specific thing, and it is very distressing that at this stage of our development, every time there is a little problem we have to seek advice and the services of some foreign expert. It is a tremendous indictment of the way in which we have been managing our affairs for the past 37 years, and I think it is critical that we deal with this problem now. If not, we would not be able to compete as there is no question of saying, "well, we do not want to compete." We would have to compete.

One of the benefits of co-ordinating our research would be to cut the cost of it. As it is now, it is disparate effort without co-ordination—everybody is doing his own thing. I think Sen. Prof. Kenny dealt with it very adequately. We need to have something more focussed; something more well directed toward specific objectives. This would mean that the private sector ought to be able to come up with some ideas as to how the scientific community would be able to assist them. We cannot do research in a vacuum. Research has to be done on the basis of a request, particularly if one is talking about applied scientific research, and there is a problem that one wants an answer to it. The funding could be partly by the state and by the particular entity or sector of the economy. It might be a business corporation or whatever entity which should be able to pay for that research. This is not happening to the extent that it should.

5.35 p.m.

We cannot continue in this way, because over the past two decades any little thing that you want to do in Trinidad and Tobago, you have to seek the assistance of somebody from abroad. Some of us feel very uncomfortable with a situation like that. It means that all we have achieved so far—and we have people, as I said, within our society, the cream of the crop intellectually and otherwise, yet very

frequently we have to do that. I know one of the difficulties with that situation is, not so much our own penchant for getting foreign assistance, but it is an imposition most of the times by some lending institutions that if you want to do something, these are the conditions, or you must employ their people who lay down the terms and conditions, and even if you insisted that what we need is a transfer of technology and so forth, even that becomes a problem.

So what we have to look at, Mr. President, is the cost of providing this kind of research. I think you learn or you get the picture in a most dramatic way when you look at the kind of resources that are necessary by the big pharmaceutical companies abroad that are doing research. You see it reflected in the price that we pay for simple things like vitamins and so forth that we need. Not to talk about pills like Viagra and that sort of thing; tremendous costs are involved.

The fact that we are small is no argument to say that we ought not to do the research. The research could be done jointly with other countries. I would like to see alliances with respect to specific areas of concern; areas that you feel you need to get some research done, and you can have a specific project in which you combine the talents of Trinidad scientists and, let us say, scientists from China, India or wherever. That would be one way in which you can cut the costs down so that we do not have to complain about that. So that the resources that we have to spend, we can have some control over that.

We have also to develop our own strategies for training our people. I was very impressed when I heard what Sen. Dr. Mc Kenzie was saying. There must be a way in which you can teach people science, and use language, images and concepts that would be appealing to young people. I think in education, being a past teacher myself, I know that what she was talking about is the play/way system. If you had somebody who could explain why this top is moving in that way and why it was moving so fast, and that sort of thing, all the scientific principles involved would become apparent. You need somebody to explain that.

What she has touched on in the area of education is using the natural situation and the natural creativity of the child, and you are building on that. Mr. President, that is building a culture of science and technology, that is what you are achieving. So you really do not have to import big scientists to come here. If you decide on what you want to do—and we say that we have to be very scientific, otherwise we are not in the game. I know, for example, that it would be safe to say that, perhaps, 10 per cent of the population at any given time would be the

cream of the society, but you have to raise the level of competence of others as well. You have to increase that so your leadership in the field would be roughly around 10 per cent; that is my view. The others would have to learn how to become attuned to this situation. It is a very creative quest.

I remember, Mr. President, in our time, when I was at school many decades ago, you had to borrow a book, maybe you borrowed it on a Friday evening, you had to return it first thing either Sunday afternoon or Monday morning, and you had to do a lot of laborious taking of notes. This is something I want to put before this honourable Senate: the good teacher would always instill in the child—whether teaching scientific principles or whatever—a thirst for knowledge or enquiry. In other words, the way in which you have presented the matter to the child would excite the child to the extent that he or she would want to know more about this, and that is the beginning of the task.

Nowadays, with all the scientific activities that are going on in the world, the Internet, computers and all these gadgets we have, the record at the university is pathetic. It was referred to recently by the vice-chancellor when he was talking about the falling off of the attendance at the university. He was making a very pertinent point. Men in our society, young boys, ought to be concerned that they were in the minority as compared to the number of ladies who were moving into higher education, but that is a topic to be dealt with elsewhere.

I want to indicate that there is something amiss to the approach we have to teaching, because it is really teaching and learning at the same time in an environment that is conducive, that makes you feel that knowledge is good, *per se*. Knowledge could be in order to get a job, but in its more spiritual and higher level, knowledge is something that you have which is akin to wisdom, and that is the aim of education—I see we have a motion here to be debated later. So while you are providing the skills, which is important, you also have the other side to it. I think that we have all admitted that man is not only matter, but he is also mind and spirit and that we have to provide for that.

In other words, are we organizing our education system? Are we harnessing all our resources and directing them to a great national objective? This is one of the problems that came up in the debate so far, that you have a number of disparate bodies doing certain things not related and interconnected. I would have thought that, perhaps, the best way to do it would be to get all the resources together, get an agreement on the major objectives that you want to achieve, set a

time frame and see how you can most effectively and efficiently utilize the resources that you have.

Mr. President, when we are thinking of the modern age and the scientific age, and everybody is talking that come January 1, 2000, so many calamities are going to take place, I am not frightened with that kind of talk at all. We have heard that so often. Sometimes you hear some crackpot saying that the end of the world would come at some time. I know there might be difficulties, and I hope that the financial institutions that are boasting, "We are all there; we are ready for them," some people do not find their accounts missing or disappearing.

I would like to emphasize that it is our will, determination and collective wisdom which must direct us now to deal with the situations with which we have to deal. When you sit at a conference with people abroad who have the benefit of all the research and things like that, you can see that they are inspired by a common purpose and are determined that they would work together to achieve that purpose. We do not seem to have that; apparently we have some difficulty in arriving at a consensus like this.

If I may say so, I do not think a motion of this kind should have that effect whatsoever. I think there ought to be total agreement that what we are doing here is looking at the situation; we have to look at the needs of the society and plan for the society and see how we can move from there. So that I am very happy to have the benefit of the wisdom, the insight of both Sen. Prof. Kenny and Sen. Prof. Ramchand, and, of course, Sen. Dr. Mc Kenzie. I was really impressed with what she said, because she really put it in a nutshell, in a way that everybody could understand, what this scientific business is.

In education it is called "teaching method" and I think that we have to get back to that. There are some people teaching mathematics and you are more confused than ever, but I have had the pleasure of seeing one of the greatest teachers that I have ever met teaching mathematics, and he was doing some figuring on the blackboard. It appeared to me that it was a complicated problem he was dealing with, but the way in which he did it, and the way he explained it, I felt that I could be a professor in mathematics like himself; so it is the way you put it.

As against that, there was another chap who would put the sum on the board, and you could not get any explanation, so much so that I felt, perhaps, mathematics is a thing you learned by instinct. In other words, it is the quality of teaching and the design of the programme that we need. The Minister of Energy and Energy Industries indicated to us about this school that has skills training. The

point I want to make is that we have to be very specific about what the needs of this society are at this point, and what it will be like, say in the next two or three years—we are talking short term; possibly you could say five years, which would be medium term—but we have to agree on that. What would happen is that all the stakeholders who are interested in doing scientific research and developing technologies, would have to get together with the Government and to agree on national objectives and a time frame. As it is, we are a bit late, unfortunately, but then all is not lost.

Mr. President, I express my support for the Motion. I think it is a good reminder that we need to look at this situation. We need to see how we can co-ordinate and what mechanism we need to do that, and to see whether we can agree on the fundamentals: what is it that we want to achieve in this area. It must be designed to achieve social objectives, so we are training people either to work for themselves or somebody else, but in the final analysis, to advance the quality of life of the people and to advance the country.

5.50 p.m.

I will end by repeating that Trinidad and Tobago has nothing to be ashamed of as far as intellectual resources are concerned. We have established that, but something is missing somewhere and this debate ought to bring us on line that if we are going to be scientific, let us agree on a programme and all of us should support it. At the same time, I will give a bit of warning that science without the humanities could produce very terrible results, and while it is necessary to propel this country forward into the 21st Century, we must not lose sight of our humanity and what it is for. All economic activity is designed to promote human happiness and human welfare, and the scientific method used, the research done, the technology are all designed for that purpose.

On that note, Mr. President, let me say that I support the Motion. It is a very appropriate one which came at the right time to remind us of some of the defects in the whole system and if we want to really prepare ourselves for the 21st Century, we ought to move and do the things we have to do in order to arrive there.

Thank you.

ADJOURNMENT

The Minister of Public Administration (Sen. The Hon. Wade Mark): Mr. President, before moving to adjourn this honourable Senate, may I remind fellow

Senators that tomorrow we are going to deal with motion No. 1 and under Bills Second Reading, we shall continue with Bills Nos. 1, and 2 and we hope to go to Bills Nos. 3 and 4 respectively.

Mr. President, I would also indicate to my colleagues that there are 25 bills on the Order Paper and I serve notice to my colleagues that from next week we are going to be starting from 10.00 a.m. and there is a possibility that we will go until 10.00 p.m. I served notice on this matter some weeks ago so no one can say that I am springing surprises.

Sen. Mahabir-Wyatt: *[Inaudible]*

Sen. The Hon. W. Mark: Sen. Mahabir-Wyatt, as I indicated, we are meeting tomorrow at 1.30 p.m. We will deal with motion No. 1 on the Order Paper on Land Acquisition, we will go on to the Bill to amend the Environmental Management Act, 1995, continue our debate on the Bill to facilitate the development of the Tourism Industry by providing to investors incentives and concessions and to make provision for matters incidental thereto; and once we are able to complete that, we go to the Bill "to make provision for the removal of human tissue for transplantation and blood for transfusion and for matters connected therewith", as well as the Bill "respecting human reproductive technologies and commercial transactions relating to human reproduction." I think one of these bills has to be referred to a select committee. *[Inaudible]*

Sen. Mahabir-Wyatt: Are all 25 on the Order Paper?

Sen. The Hon. W. Mark: Yes, all 25.

Mr. President, I beg to move that the Senate do now adjourn to Wednesday, November 24, 1999 at 1.30 p.m.

Question put and agreed to.

Senate adjourned accordingly.

Adjourned at 5.55 p.m.