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THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA
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PARLIAMENTARY STANDING COMMITTEE
ON PUBLIC WORKS.
Clerk of the Senate.
19th Mar., 1929.

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE

RELATING TO THE

PROPOSED CONSTRUCTION OF BUILDINGS

FOR THE

INSTITUTE OF ANATOMY,

AT

CANBERRA.

B. Sulistyar.

B. J. GREEN, GOVERNMENT PRINTER, CANBERRA.

MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

(Sixth Committee.)

MALCOLM DUNCAN CAMERON, Esquire, M.P., Chairman.

Senate.
 Senator John Barnes.
 Senator Herbert James Mockford Payne.
 Senator Mathew Reid.

House of Representatives.
 Percy Edmund Coleman, Esquire, M.P.
 Josiah Francis, Esquire, M.P.
 The Honorable Henry Gregory, M.P.
 David Sydney Jackson, Esquire, M.P.
 David Charles McGrath, Esquire, M.P.

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

INSTITUTE OF ANATOMY, CANBERRA.

REPORT.

The Parliamentary Standing Committee on Public Works, to which the House of Representatives remitted for further consideration and report the question of the proposed construction of buildings and formation of a zoological reserve at Canberra for the Institute of Anatomy (formerly known as the National Museum of Australian Zoology), has the honour to report as follows :—

INTRODUCTORY.

1. Medical scientists claim that a true knowledge of the complexities of the human body can be obtained only by a study of those types of animals in which the various parts can be demonstrated in their simpler forms. In consideration of any diseased tissue of the human body, such as cancer, a comparison must be made with the condition in health—the abnormal must be compared with the normal. But one cannot rely on obtaining typical normal mammalian tissue in any individual because of the effects, over centuries, of alcohol, syphilis, and other poisons on the human race, nor is such tissue found in the animals commonly used for demonstration, such as dogs, rabbits, and guinea pigs, owing to modification by domestication. It is therefore to primitive mammals, unaffected by syphilis, alcohol, or domestication, that have lived in a natural environment for millions of years, that we must look for normal tissue, and it is in Australia alone of all the world where exist these simple types of mammals, the study of which is absolutely essential for a correct understanding of the human body, not only in health but also in disease.

2. Those who have studied the Australian animals feel certain that they are doomed to extinction, and it is computed that in less than twenty years they will, in the absence of urgent protective measures, have all disappeared. Hence is urged the importance of concentration upon the scientific study of these animals while live specimens are still obtainable, and of securing and preserving as many specimens as possible before it is too late, not only for the benefit of present day workers, but for future generations who will not have the opportunity of seeing the animals in their natural state.

3. During the past eighteen years Dr. William Colin MacKenzie has collected specimens of Australian fauna and has made them the subject of scientific research, while thousands of specimens of organs, muscles, skeletons, and microscopic slides have been accumulated at the doctor's own residence at St. Kilda-road, Melbourne.

4. In 1923 Dr. MacKenzie offered as a gift to the Commonwealth his collection of live animals, as well as his unique collection of specimens, and at the same time made his services available, without salary, in furtherance of the work which he had been carrying out at his own expense for so long. This offer was accepted with expressions of gratitude and an agreement, ratified by Act of Parliament, was entered into, under which the Commonwealth undertook, after the transfer of the Seat of Government to Canberra, to construct at its own expense such buildings and other enclosures as in its opinion are necessary or desirable for the accommodation of the collection.

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VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES, No. 9.

Dated 22nd February, 1929.

6. PUBLIC WORKS COMMITTEE—REFERENCE OF WORK—INSTITUTE OF ANATOMY, CANBERRA.—Mr. Aubrey Abbott (Minister for Home Affairs) moved, pursuant to notice, That, in accordance with the provisions of the Commonwealth Public Works Committee Act 1913-1921, the report of the Parliamentary Standing Committee on Public Works on the proposed construction of buildings and formation of zoological reservation at Canberra for the Institute of Anatomy (formerly known as the National Museum of Australian Zoology) shall, for the purpose of considering certain modifications of the proposed work which appear to be necessary, as the result of the development of the preliminary scheme originally submitted to the Committee, be remitted to the Committee for its further consideration and report.

Debate ensued.
 Question—put and passed.

LIST OF WITNESSES.

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Blackett, William Arthur Mordey, President of the Royal Victorian Institute of Architects, Melbourne	2, 36
Butters, Sir John Henry, Chief Commissioner, Federal Capital Commission, Canberra	13, 27, 37
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MacKenzie, Professor William Colin, M.D., F.R.C.S., F.R.S. (Edin.), Director Australian Institute of Anatomy Melbourne	1, 34
Marsh, Sidney Frank, Managing Director of Whitehurst's Uralla Granite Co., Ltd., Sydney	25
Morris, Walter Haywood, Designing Architect, Federal Capital Commission, Canberra	15, 36, 32
Murdoch, John Smith, Director-General of Works and Chief Architect, Department of Works and Railways	17
Waterhouse, Bertrand James, Architect, Sydney	7, 19
Wilkinson, Professor Leslie, Professor of Architecture, University of Sydney	4

5. In March, 1927, the Parliamentary Standing Committee on Public Works reported favorably on a proposal to construct a building to provide for a museum chamber, lecture hall, storage basement, and other accommodation, and to prepare a reservation including provision of animal enclosure, reptile house, pond enclosure, fencing, water supply, sewerage, residences, &c.

6. Under the scheme then put forward the estimated cost was set down at—

	£	£
Museum building	61,900	
Electric light	2,000	
Sewerage and drainage	1,100	
Lay-out of grounds	1,000	
	—————	66,000
Reservation—		
Animal enclosure, reptile house, pond enclosure	10,000	
Excavation	500	
Gravel pathways, roadways, &c.	1,300	
Two feeding houses and small grain stores for kangaroo and wallaby paddocks	280	
Fencing	1,000	
Water supply and sewerage	1,000	
	—————	14,080
Residences—		
Director's house (in proximity to Museum)	3,000	
Curator's house (in the reservation area)	2,000	
Staff house " "	2,000	
	—————	7,000
Total	—————	87,080

7. The work of developing the scheme was subsequently undertaken by the Federal Capital Commission, and, as a result of further consultations and investigations, it was considered eminently desirable to provide additional accommodation to deal with the ever increasing size of the collection of specimens and the research work which will be undertaken by the Institute. This involved an enlarged proposal for the museum building, and a detailed study of the scheme suggested a complete change in the architectural treatment. As these proposals represented a substantial variation of the scheme as originally reported upon by the Parliamentary Standing Committee on Public Works, the matter was remitted for the further consideration of that committee on 14th June, 1928, but Parliament dissolved before the Committee was in a position to submit its report. A further submission of the matter was therefore made to the Committee by the House of Representatives on 22nd February, 1929.

PRESENT PROPOSAL.

8. The present proposal differs from that originally submitted mainly in the shape and design of the museum. In the revised plans the main administrative and laboratory block is the same as before, but the museum, instead of being a single block extending from the centre of the building backwards, is now in two separate parts running back from each end of the building, and enclosing a quadrangle. It is claimed that this gives more space, which, it has been ascertained, will be required almost immediately, while at the same time permitting of economical extensions if ever required in the future.

Description of the Building.

9. The building comprises chiefly two sections, viz. :—(a) The administrative block devoted to administration and research, and (b) the museum block, intended for the display of specimens.

(a) The administrative block consists of—

- (i) Basement containing osteology room, boiler room, fan rooms, lavatory, strong room, and elevator over storage space ;
- (ii) Ground floor containing entrance hall with attendant's booth, and stall, anthropology room, histology room, director's room, secretary's room and waiting room, research room, lavatories, library and lecture room, two staircases and elevator connecting with upper floor ;
- (iii) First floor containing dissection room, osteology room, artist's and photographer's room with dark room, six research rooms, cinema projection and rewinding rooms ;
- (iv) Flat roof with staircase access.

(b) The museum block is made up of two units approximately 52 feet by 87 feet, each containing—

- (i) Basement for storage ;
- (ii) Ground floor for exhibition of specimens ;
- (iii) Gallery.

Type of Construction Proposed.

10. It is proposed that the building shall be constructed with reinforced concrete footings, with external brick walls solid to ground level, and from the ground level to the parapet to be faced with stone. The walls of the quadrangle are to be of solid brick from footings to parapet, and from the ground to the parapet to be rendered in cement. Internal walls and partitions will be of brick cement rendered. In the administrative block the basement floor will be of concrete, damp-proofed with asphalt and finished cement rendered. The ground floor will be of reinforced concrete. The entrance hall, corridors and lavatories are to be finished in tile or suitable paving, the remainder covered with wood flooring.

The entrance steps are intended to be of granite or other approved hard stone. The first floor will be of reinforced concrete, the lavatory paved, the remainder finished in wood. Staircases and projection room finished with concrete rendered. The flat roof to be of reinforced concrete covered with bituminous felt and gravel.

In the museum block the basement will have concrete floors, damp-proofed with asphalt, finished cement rendered ; the ground floor and the galleries of reinforced concrete finished with wood flooring. The roof of the museum block is proposed to be constructed of steel girders covered on top with protected metal on wood purlins, and on the bottom with a ceiling of fibro-plaster sheeting. Large double-glassed windows to both sides of each museum provide requisite lighting, while the lighting of the library and entrance hall will be secured by lantern lights.

11. The ceiling heights are as follow :—

Administrative block—

- Basement, 9 feet (average).
- Ground floor, 12 feet.
- First floor, 11 feet.

Museum block—

- Basement, 8 ft. 6 in. (average).
- Ground floor to ceiling, 24 feet.
- Ground floor to gallery, 12 feet.

Ceilings will be finished with cement rendering and coloured white.

12. The joinery, consisting of doors and book cases in the library, will be of cedar, black bean, or other suitable Australian timbers, and the benches in the laboratories are to be of pine. Steel and bronzed frame windows and sashes are installed throughout.

13. The loggia to the quadrangle is to have a concrete floor, finished cement rendered, brick piers cement rendered, and a concrete slab roof containing skylights near the laboratory windows.

14. Electric light is allowed for to all rooms, entrance portico, and colonnade ; an elevator is to be installed, and a hot water system is provided to all main rooms. Generally, the construction is intended to be such as to render the buildings highly fire-resisting.

ESTIMATED COST.

15. The estimated cost of the present proposal, as submitted to the Committee, is now set down at:—

	£	£
<i>(a) Main Contract—</i>		
Skeleton building	44,934	
Concrete floors	6,800	
Stone facing	15,622	
Water and sewerage installation	2,104	
Contingency sum	2,500	
		71,960
<i>(b) Direct Services—</i>		
Fire service	304	
Heating installation	5,900	
Electrical installation	2,500	
Lift installation	2,300	
		11,004
		82,964
<i>(c) Administrative charge—</i>		
6 per cent. on total	4,978	
Total		87,942
<i>(d) Interest charges during tenure of contract—</i>		
5½ per cent. on total for nine months	3,028	
Total		91,570
<i>(e) Services outside of building, but associated with it—</i>		
Kerbing, guttering, footpaths, preparation of site for planting, &c. (half cost—approximate)	1,700	
Planting of site and garden layout	2,000	
Extension of sewer reticulation to site boundary	606	
Extension of electric supply cable to site boundary	400	
Extension of fire main to site boundary	30	
		4,736
Grand Total		96,306

NOTE.—This is exclusive of the amount of £7,000 mentioned in the previous report as being required for the residences of the Director, Curator and Staff, and the amount of £14,080 to be spent on the zoological reservation.

The time fixed for the completion of the Institute building is set down at eighteen months from the date of commencement.

COMMITTEE'S INVESTIGATIONS.

16. The Committee viewed the site suggested for the Institute buildings, and inspected the many thousands of normal histological preparations from reptiles and primitive mammals of Australia and Tasmania kept by Professor MacKenzie at his residence, St. Kilda-road, Melbourne. A careful study was made of the plans submitted, and evidence obtained from Professor MacKenzie, the Chief Commissioner and the Designing Architect of the Federal Capital Commission, representatives of the Canberra Architectural Advisory Committee, and others.

Value of Collection.

17. In view of the amount proposed to be expended by the Commonwealth in providing this Museum at Canberra, the Committee during the course of its investigations thought it not inappropriate to endeavour to arrive at the value which might be placed on the collection it is proposed to house there.

In this connexion, it might be mentioned that in a leading article which appeared in the *British Medical Journal* of 17th January, 1923, it was stated:—

"The announcement that the Commonwealth Government has passed an Act to establish a Museum of Australian Zoology will be hailed with the greatest possible pleasure by men of science throughout the world. It seems to be agreed that the whole indigenous fauna of Australia is only too likely to follow Tasmanian man to extinction. There is clearly an obligation on Australia to preserve a full series of specimens. Comparative anatomy is one of the foundation sciences of medicine; the Australian fauna illustrates it in many places, and its study, though prosecuted for more than one generation, still calls aloud for the work of many another. The nucleus of the National Museum of Australian Zoology is undoubtedly the greatest in the world dealing with Australian fauna. It is now established in Melbourne, but will be transferred to the new Commonwealth Capital at Canberra, which will then become the world's centre for the study of Australian fauna."

The *Medical Journal of Australia*, on 28th November, 1924, published an article in which appears the following:—

"The collection is well-known to the profession, and is recognized as one of very high scientific value. It represents the labours of many years by a keen and competent anatomist and investigator and its creation has entailed a considerable expenditure of money. No one will claim that the work is completed; there is still much to be done. But the collection which Dr. MacKenzie has given to the nation is an extremely valuable one, and one from which an immense amount of knowledge can be gathered."

18. The monetary value of the collection to be housed can hardly be estimated, although it was stated in evidence that if offered to America it would readily realize £100,000. It is, of course, obvious that in the future, when live specimens are not obtainable, this collection will be of a value without price.

19. With the establishment of the Museum at Canberra, it is expected that many people now holding valuable collections of specimens will present them to the nation, as has recently been done by Mr. Murray Black, Dr. Arthur Nankivell and Dr. George Horne (who presented his collection, valued at £25,000, dealing with the "Stone Age Man of Australia").

Site.

20. The site selected for the proposed Institute building comprises a block of land semi-circular in shape, and containing an area of approximately 5½ acres. It occupies a commanding position in close proximity to the University reserve, and is good building land. It is in a position easy of access, and, as it is to be laid out in gardens, it should be, in the opinion of the Committee, eminently suitable for the purpose for which it is intended, and form an attractive feature in the general development and beautification of the city.

Building.

21. The plans for the building, prepared by the Federal Capital Commission, have been subject to review by the Canberra Architectural Advisory Committee, consisting of five outstanding architects of Sydney and Melbourne. As designed, the structure will have a frontage of 183 feet by a depth of 134 feet, and to the top of the parapet will be approximately 35 feet 6 inches high.

It is claimed that it is of a type somewhat new to Australia, but in keeping with the class of structure laid down for Canberra, and one well worthy of the site it occupies, and the purpose it is destined to serve.

Revision of Plan.

22. Evidence taken by the Committee indicated that the revision of the plan to provide two museum blocks instead of one, would permit of more display space for present and future requirements, and allow of more economical extension if desired. As this alteration, as also the size and disposition of the rooms in the administrative block, have been suggested after close collaboration with Professor MacKenzie, the Committee is satisfied that the accommodation proposed to be provided will be satisfactory in every way.

Facing.

23. Careful attention was given to the proposal to face the external portions of the building with sandstone, and considerable pains were taken to ascertain the best type of stone to be used. Although realizing that sandstone may be expected to have a limited life, expert opinions obtained indicated that granite would not be a satisfactory medium for a structure of this character, and that preference should be given for a light coloured sandstone. With these opinions the Committee is constrained to agree, and is assured that picked stone, carefully laid, with a 7 inch base course of granite as suggested, will provide a building that, with a little attention, may be expected to last for many years.

24. To guard against the possibility of exploitation, however, the Committee recommends that tenders for the highest quality sandstone should be called in such a manner as to preclude the possibility of supply being restricted to any particular quarry.

Roofing.

25. In view of the trouble experienced in some places on account of the penetration of water through the flat roofs of large buildings, the Committee gave close attention to the class of roof proposed in this instance. One witness expressed the opinion that a covering of neuchatel asphalt laid on the flat roof would be preferable, but as the weight of expert evidence indicated that the use of bituminous felt and gravel is the most satisfactory form of treatment known to science at the present time, the Committee approves of such material being used.

26. The Committee was unfavorably impressed by the unaesthetic structures on the roof, covering the elevator machinery and the staircase, but was informed in evidence that they would be somewhat masked by the parapet, excepting when viewed from some distance. It was ascertained, however, that at some slight additional expense the elevator machinery could be accommodated in the basement, and thus obviate the necessity for one of the structures on the roof, and it is recommended that this be done, and that an effort be made also to eliminate or reduce as much as possible the one over the staircase.

Water and Sewerage.

27. The Committee ascertained in evidence that no difficulty will be experienced in connecting this structure with the existing sewer; that a plentiful water supply is assured; and that appropriate steps are being taken to ensure adequate protection in the unlikely event of fire. Special attention has been paid to the question of lighting and ventilation, and the Committee is satisfied that the building will be satisfactory in this respect.

Supply of Material.

28. The question was raised as to the wisdom or economy of the policy, adopted by the Federal Capital Commission, of requiring successful tenderers to purchase certain articles and material from the Commission, as it was suggested that the cost of the building might be lessened by successful tenderers being able to secure in the open market such articles or material at a cheaper rate than they could be supplied by the Commission. From the Commission point of view it was argued that under the procedure adopted, greater control could be exercised over the quality of the material used; furthermore, that large stocks of building material were purchased by the Commission when it was anticipated that the building programme entered upon would be continued and that, although the Commission was not responsible for the change of policy which prevented the building programme being carried out, it was clearly a duty to the taxpayer to endeavour to reduce the quantity of stores held by utilizing them wherever possible. After due consideration the Committee agreed that it was in the public interest to follow the course proposed by the Federal Capital Commission.

The decision arrived at by the Committee in connection with this matter is shown by the following extract from its minutes of proceedings, viz. :—

" Mr. Gregory moved that the Committee is not satisfied that it is a wise or economical policy on the part of the Federal Capital Commission, to insist upon the successful tenderer for the construction of this building purchasing a large portion of the material required for its construction from the Commission, and recommends that further specifications be prepared, and the compulsory clause that certain articles be purchased from or through the Commission be expunged.

Seconded by Senator Payne (pro forma)—

The Committee divided on the motion—

Aye, 1.

Mr. Gregory.

Noes, 7.
 Senator Barnes.
 Payne.
 Reid.
 Mr. Cameron.
 Coleman.
 Francis.
 McGrath.

and so it passed in the negative."

Invitation of Tenders.

29. Some disapprobation was expressed at the action of the Federal Capital Commission in inviting tenders for the erection of this building before the Committee had submitted its report on the proposal to Parliament. Although it was stated that in view of the urgency of the matter these steps had been taken solely with the idea of saving as much time as possible, the Committee considers the practice unsound, and trusts that it will not be repeated.

Residences.

30. In connexion with this inquiry no stress has been laid on the fact that the previous approval covered also the provision of a residence for the Director, at an estimated cost of £3,000 to be erected in proximity to the museum, and residences for the caretaker and staff to be provided on the zoological reservation. It is stipulated in the agreement with Dr. MacKenzie that these residences should be provided, and it is claimed that at least the Director's residence should be ready for occupation by the time the Institute is completed. The actual site of this residence was not indicated, but the Committee considers that, for the purpose of efficient administration and convenience of distinguished scientists visiting the Institute, the Director's residence should be as close as possible to the Institute, and, as it is unlikely that any suitable vacant residential area exists in the vicinity, suggests that the residence might well be located in a suitable and unobtrusive position within the area of 5½ acres reserved for the Institute.

SUMMARY OF RECOMMENDATIONS.

31. Briefly summarized, the recommendations of the Committee are :—

- (i) that in order to honour the terms of the agreement entered into with Dr. MacKenzie, it is incumbent on the Commonwealth to proceed with the erection of the Institute of Anatomy at Canberra as early as possible;
- (ii) that the original plan be modified by providing two museum chambers instead of one, with greater accommodation and provision for extension, as suggested;
- (iii) that the building be faced with a light coloured sandstone, but that tenders be called for the highest quality material, in such a manner as to preclude the possibility of supply being restricted to one particular quarry;
- (iv) that steps be taken to eliminate or modify the unaesthetic structures over the stairway and lift machinery on the roof;
- (v) that the most effective method of ensuring that the flat roof shall be weather-proof is by treatment with bituminous felt and gravel;
- (vi) that the residence of the Director should be ready for occupation on completion of the Institute;
- (vii) that the Director's residence should be located within the area reserved for the Institute.


 Chairman.

Office of the Parliamentary Standing Committee on Public Works,
 Parliament House, Canberra.

12th March, 1929.

MINUTES OF EVIDENCE.

(Taken at Melbourne.)

WEDNESDAY, 5TH SEPTEMBER, 1928.

(SECTIONAL COMMITTEE.)

Present:

Senator BARNES, in the Chair;
Senator Reid | Mr. McGrath.

Professor William Colin MacKenzie, M.D., F.R.C.S., F.R.S. (Edin.), Director Australian Institute of Anatomy, sworn and examined.

1. To Senator Barnes.—The altered plans for the proposed Institute of Anatomy at Canberra, provide a better grouping of the rooms and are in every respect an improvement on the original proposal. The museum block is separated from the administrative and the research block, so it will be possible to display the specimens to better advantage, and the facilities for research study will be much improved. In addition it will allow for future extension. The alteration in plans has, I understand, been suggested by the Federal Capital Commission, and a body known as the Committee of Public Taste, comprising Professor Wilkinson, Sir John Harrison, Mr. Waterhouse and Mr. Goodsell (Sydney), and Mr. Henderson and Mr. Blackett (Melbourne). They took the view that the original design for the building would not do justice to the site, and that therefore it was desirable to submit an amended plan which, as I have stated, will provide greater facilities for the display of the exhibits and increase the usefulness of the institute. Since last I was before the committee the number of specimens has been nearly doubled, so it is imperative that an early start should be made with the building. Much interest is being taken in the institute. Already two grants each of £1,000 have been made for the purpose of providing a fee for annual lectures. The first of these will be delivered by Professor Osborne in November, and the second by the Director-General of Health (Dr. Campston) in March next. We are continually receiving new specimens, and weekly we are adding to our collection. Already we have a great quantity of specimens in store. The institute is now under the Department of Health, and it constitutes an important adjunct to the department's activities. The institute will become one of the most important in the world; occupying in Australia a place in the scientific world like that of the Hunterian Museum in connexion with the College of Surgeons in England, which is the largest museum of its kind in the world. It was established 200 years ago. During the Great War the whole of the medical activities in Great Britain were concentrated in that museum. If any problem arose in relation to medical research it was referred to the authorities of that institution for determination. It is an accepted fact that anatomy is the basis of all medical and surgical problems. It will be seen therefore that the Department of Health now has a most important weapon under its control as regards the general health of the community. It has been my privilege to inspect all the museums in the world, and I can say that the Institute of Anatomy, which it is proposed to establish at Canberra, will be the most important in the southern hemisphere, ranking second to the Hunterian Museum in London. Almost every

day we are receiving inquiries from medical authorities in other parts of the world. This week we had an inquiry from the Research Institute of Pennsylvania asking for certain information in connexion with cancer in the breast. The authorities there were in difficulties, and it was important that they should be furnished with anatomical information which was at our disposal, because in Australia we have a monopoly of monotremes and marsupial fauna. Accordingly we were able to prepare the information for the research body in Pennsylvania and it will go forward this week. The proposed new building will meet the requirements of the institute for ten years. It is important that this work should be put in hand without delay, because the establishment of the institute at Canberra will encourage men who formerly had been sending specimens out of Australia to send them to Canberra for preservation and future use. It is lamentable to think that we have only one specimen in Australia of the Tasmanian aboriginal, and that we have to apply to the Hunterian Museum for much information that should be available in Australia. The Hunterian Museum has three magnificent skeletons of the Tasmanian aboriginal, against one in Australia. In the interests of the nation it is imperative that this work should be proceeded with at once. Specimens sent to the institute by persons in Australia will be officially catalogued with the names of the donors, and will be regarded as the property of the nation. It is gratifying to know that the proposal is receiving recognition throughout the Commonwealth, and that valuable specimens and records are being received; for example, Dr. Clendinning, the well-known X-ray specialist at the Melbourne General Hospital, whose father was the pioneer in this special branch of medical science, has decided to present to the museum a large collection of X-ray photographs showing normal joints and bones. These will be available for any student who may wish to study the structure of normal joints, and will be a most valuable addition to the museum's exhibits. I may mention also that an area has been reserved close to the institute site for the erection of a building for the College of Surgeons. This movement will do much to improve and raise the status of medical science in this part of the world. Australia should really dominate the Pacific. I consulted with Mr. Murdoch and the committee of architects in Melbourne with regard to the proposed alterations, and understand that Mr. Murdoch has approved of these. I have not the slightest doubt that when the institute is established in Canberra, scientists from other countries will visit Australia to study our unique specimens in the furtherance of medical and surgical knowledge. Only a few weeks ago we had a request for information from the Orthopedic Surgeons' Institute in Canada concerning treatment of infantile paralysis. These inquiries indicate the wide-spread interest in the work which we are doing in Australia. Students from all parts of the world will be attracted to this country in the search for material dealing with the particular phase of health research in which they are interested. Not so long ago we had a request from the Mayo clinic in the United States of America for scientific material. William Mayo, one of the leading surgeons in the United States of America, was in Australia not long ago and appreciated what is being done here. It is anticipated that eventually we shall be able to arrange for orations or lectures at more frequent

intervals, possibly once a month. A lecturing fee of £50 should induce research workers from even the distant States to come to Canberra and tell the people what they know. The lectures will, I presume, be broadcast, and certainly they will be published for the information of the general public. Professor Osborne, in November, will deliver the Halford oration. I may not be known generally that Professor Halford founded the first medical school in Australia. He came to this country in 1802, and established a school with two or three students. From this small beginning there has arisen the medical school attached to the Melbourne University, a school which can take its place alongside any other similar school in the world. The founder of this school did a great work, but his memory has faded. Professor Osborne's oration should do something to perpetuate it.

2. *To Mr. McGrath.*—The Institute of Anatomy will be in a sense linked up with the proposed Institute of Public Health in Sydney, because both institutions will be concerned with the general health of the people. Lectures delivered at the institute will not be intended for students only, but for the people generally. We are hoping that when this institute is established, men who are doing research work will be stimulated to tell the people about it. In this way we anticipate reculating papers containing information of the highest value. The Hunterian Museum works along these lines. When Faraday, the noted chemist, died he left to the Royal Institute of London a sum of money to provide for a series of lectures to juveniles every year. Under this arrangement eminent scientific men deliver lectures ranging over six days to young people from nine to sixteen years of age. The orations are couched in simple language and deal with the latest scientific subjects. They are of absorbing interest, and are looked forward to with the greatest eagerness by young people in England. As far as I am aware the Public Taste Committee did not make any recommendation with regard to the original building scheme. We are practically crowded out in Melbourne with specimens, so it is important that there should be no further delay in building operations at Canberra. Actually our working rooms are being utilized for the display of specimens. The agreement with the Commonwealth Government for the housing of the exhibits expired in August of last year. I am satisfied that a building in accordance with the amended design will meet all our requirements and be more convenient than the original proposal.

3. *To Senator Reid.*—I am confident that the institute will attract visitors to Canberra, and that the additional expenditure on the amended design is justified. I believe that the greater provision now being made will encourage Australians to send specimens to us instead of forwarding them to other countries. Australia is, as yet, unexplored in this branch of scientific research; there is a tremendous amount of work to be done yet. Reports of lectures or orations that may be delivered in Canberra will be forwarded to scientific bodies all over the world. There is a wide field for discussion by means of public lectures at the institute. Valuable information may be in this way, obtained concerning economic subjects, the pastoral or agricultural industries, and many other phases of industrial activities in Australia. Lectures by some of our leading pastoralists would result in the accumulation of a vast amount of important information bearing on that industry. Actually there is no reason why lectures should not be delivered in Canberra quite frequently. At present many important visiting scientists come to Australia and go away again without being heard of. They do things differently in America. If a man visits any city of importance in that country

the people try to find out if he is an authority on any subject, and if so they ask him to deliver a lecture. And the same course might well be adopted at Canberra. I am sure that many eminent visitors would be glad of an opportunity to deliver lectures in the lecture room at the proposed institute. There will be accommodation there for 100 people. Any delay in building operations will seriously interfere with the work of the institute because, as I have stated, we are already crowded out with exhibits. It is not fair to the specimens that they should be housed in unsuitable rooms. They are the property of the nation, and should be displayed to the best advantage.

(Taken at Melbourne).

THURSDAY, 6TH SEPTEMBER, 1928.

(SECTIONAL COMMITTEE.)

Present:

Senator BARNES, in the Chair;
Senator Reid. | Mr. McGrath.

William Arthur Mordey Blackett, Architect, President of the Royal Victorian Institute of Architects, Member of the Federal Council of the Institutes of Architects of Australia, and Member of the Advisory Committee of Public Taste to the Federal Capital Commission, sworn and examined.

4. *To Senator Barnes.*—I have been in touch with the proposal to erect an Institute of Anatomy at Canberra from its earlier stages, and I have inspected the various sketch plans prepared for the proposed building. The Advisory Committee on Public Taste was appointed by the Federal Capital Commission to advise the committee concerning the plans and lay-out of important public buildings to be erected by the Commission in Canberra. The committee comprises Mr. G. H. Godsell (Sydney), Mr. B. J. Waterhouse (Sydney), Professor Wilkinson (of Sydney University), Mr. Kingsley Henderson (Melbourne), and myself. It is practically an honorary committee, functioning in the public interest in relation to the erection of public buildings at Canberra. As a member of this body, I attended the conferences at Sydney, Melbourne, and another at Canberra, to consider the design and lay-out of the Institute of Anatomy in relation to the site. The amended plan is a modification of the original proposal, and has been submitted as a result of suggestions made by the committee. The aim has been to ensure the erection of a building simpler in design and more monumental in type, and appropriate for the site, which is one of the finest in Canberra. We had to consider, also, its relation to the future University buildings, which will be erected almost immediately behind the institute. The amended design is for a building which will better fulfil the purpose for which it is designed. There is slightly more accommodation for the two museums, and the quadrangle will provide sheltered spaces within the centre of the building, and give inner communication by enclosed covered ways. In the original design the architect made a feature of the staircase, but the committee considered that, as the upper portion of the building would be utilized almost entirely for research, it would not be necessary to give access to the top floors except to persons directly concerned in the work or in consultation with the director. It is suggested, therefore, that the staircase should be placed in segregated positions at each end. In this way we can provide better inter-communication for the staff working on research and give, also, direct communication with the museums and library. The

committee had in mind, also, the probable need for extensions on the north-west elevation at some future time, and the building has been designed with that end in view. We consider that as the museum would be utilized more as a working institute rather than for entertainment of visitors, it would be desirable to have the building planned in its amended form. The position at Canberra with regard to public buildings is different from that in other cities. Because of the lay-out of the Capital, attention must be given to the architectural treatment of all sides of important public buildings. This is responsible for some portion of the added cost of public buildings in Canberra. The committee, however, considered the need for reasonable economy, and I can say that the design of the Institute is reasonably economical, having regard to its semi-monumental character. We have to remember that all such buildings in the Federal Capital will be visited by eminent people from other countries, and, therefore, they should do credit to the people of Australia. We have to consider, also, the view-point of people in, say, a couple of hundred years' time in regard to all important Commonwealth public buildings. If, in the future, there may arise the need for further extension of the building, wings could be added at each end of the Liverpool-street frontage without interfering with the symmetrical design of the building. We felt, too, that there should be another entrance from the University side, because this building will work in liaison with the University building when it is erected. We recommended, also, that the interior treatment of the quadrangle should be as simple as possible, and on the score of economy suggested that it should not be faced with stone or similar material. The museums will be somewhat larger than in the original plan. In this respect the amended design accords with the approval of Dr. MacKenzie. The original scheme provided for windows in the lecture hall. Since practically all the lectures will be illustrated by biograph pictures, it is considered desirable not to have windows, and to have top lighting for the lecture hall. The Committee of Public Taste unanimously agreed that the new design was a great improvement upon the original proposal. One of the designs provided for the flanks to be faced in brick. We consider that the building should have one tone colour for all its wall surfaces on account of its exposed position, and because of its relation to other important government buildings in Canberra. I understand that it is to be faced on three sides with stone.

5. *To Mr. McGrath.*—We recommended the use of Gosford stone, as being more economical than the Hawkesbury stone. In this matter we had to be guided by the opinion of the New South Wales architect by the opinion of the New South Wales architect, because Australia is such a big country that one does not know the life quality of all building stones. The Gosford stone is now recommended. The general design is modern in treatment and slightly derivative from classic influences without being classic in its entire development.

6. *To Senator Barnes.*—We gave consideration to the possibility of utilizing synthetic stone, and came to the conclusion that it would not be economically advantageous. We preferred the use of natural stone for the facing.

7. *To Mr. McGrath.*—We considered that, on account of the cost, which would probably be four or five times that of stone, it would not be desirable to use granite.

8. *To Senator Reid.*—It is generally accepted that freestone will last for a reasonably indefinite time. Buildings, such as cathedrals, in Europe, erected in freestone, have lasted for several hundreds of years

without the need for excessive expenditure in maintenance. The proposed institute is not an integral stone building. The proposal is to face it with stone, so that if in future if a block shows signs of decay it may be refaced at comparatively slight expenditure. Moreover, the design avoids weather entices, and on light such as that at Canberra, buildings may be designed with less detail and still retain their interest. As there will be an absence of smoke in Canberra, stone-faced buildings should be more durable than in a city like Melbourne. Granite, being more costly, should be reserved for the more important public buildings. The committee considered that the original design would give an elevation too broken up in the mass. We disliked the dumb-bell plan, which gives ugly shadows on the flanks, and we did not like the two entrances on the ground floor. We suggested that there should be provision for an attendant and a stall at the main entrance, where photographs could be sold by an attendant, who could, at the same time, have the whole of the inner communication of the building in his view. We recommended that the gallery should be wider, but Dr. MacKenzie assured us that the gallery, as shown, was wide enough, and in a matter like this, we were guided by his technical advice. I understand that an expert of the Federal Capital Commission is in America studying the most recent developments in museum lighting. To distribute the light more evenly, it was suggested that the skylight should be fitted with an inner veil. This should do away with the reflection of light on the specimen cases—a rather serious matter in museums. The estimated cost of the building is £25,000, compared with £66,000, the cost of the original proposal. The storage spaces provided in the basement should account for a great part of the extra cost. There is also a lift now provided, for the moving of the larger specimens from one floor to the other. I understand that some of the specimens are extremely valuable, so it would be unwise to risk damaging them by carrying them up stairways. I consider it wise to incur the extra expenditure at a later date in altering the building to meet the expanding needs of the institute.

9. *To Mr. McGrath.*—All members of the Committee of Public Taste were agreed as to the desirableness of recommending the adoption of the amended design. I understand that there is provision for roofs and floors of a type that would reduce the temperature of the building. We were given to understand that this type of floor is necessary. Members of the Federal Capital Commission were not in consultation with the Committee of Public Taste concerning the desirableness of altering the design. We met Sir John Harrison in Sydney; but he did not take part in the discussion, except in introduction of the matter to the committee, nor did he influence the committee in arriving at its decision. I am sure that the amended design has the approval of the Federal Capital Commission. I think that the idea which the Federal Capital Commission had in mind, when it asked us to consider the original design, was to get an outside opinion as to the suitability of the design of important public buildings in Canberra in relation to their site, and their harmony with other buildings. This appears to me to be a reasonably sound policy. It has been adopted by the French Government, which has set up a Ministry of Fine Arts; but it is the first time that it has been adopted in Australia. I am satisfied that, from an aesthetic point of view, the proposed alterations are desirable and that the building will be more suitable for the purpose.

(Taken at Sydney.)

SATURDAY, 8TH SEPTEMBER, 1928.

(SECTIONAL COMMITTEE.)

Present:

Senator REID, Chairman;
Mr. Cook Mr. Seabrook.

Leslie Wilkinson, Professor of Architecture, University of Sydney, sworn and examined.

10. To Senator Reid.—I am aware of the proposal to establish an institute of anatomy at Canberra; but this morning was the first occasion upon which I have seen the completed plans. I am a member of the Committee of Public Taste, by whom this proposal was discussed. Several designs for the building were submitted to that committee some months ago. Later the committee met at Canberra, and some alterations were suggested. The plans before this committee now are probably the outcome of suggestions made by the Committee of Public Taste. I did not see the original plan which the Public Works Committee passed and submitted to Parliament, nor was I aware that any such plan had been prepared. Three plans were submitted to the Committee of Public Taste, one of them prepared by the Works and Railways Department, one by an official of that department independently, and a third by the architects' branch of the Federal Capital Commission. After examining the plans the committee selected one, and suggested that it should be altered so as to make provision for a courtyard. In considering the elevation of one of the plans, we decided that the lack of any principal entrance was a defect. The plan provides for two side entrances, but no main one. We felt that a museum should have an obvious and well-defined main entrance. All the designs provided for a great deal of sky-lighting, but if I know anything of summer conditions in Canberra, and, indeed, in Australia generally, sky-lights are practically impossible during the heat of the day. One needs high lighting, but not glass in the roof. The committee recommended that the plan instead of taking an "H" shape, should be built in the form of the letter "U," so that by future extensions it might ultimately enclose a courtyard, although I, myself, would have preferred to leave it open. Dr. MacKenzie was at first in favour of having one big museum, but the difficulty was to provide such a museum, and place the courtyard where it is. Eventually he agreed to two museums with the courtyard in the middle. It was considered that the courtyard would be practically an open-air museum, in which certain of the specimens might be very fittingly displayed. The interior court is a very fine part of the museum itself. There should be splendid native trees planted in it, and there might also be live native birds and animals kept there as well. These ideas were not recorded as the official opinion of the committee, but they were mentioned during the course of the discussion. We did not get down to details in regard to accommodation for students. The committee did not know how large the collection was to be. We did not make any vital alterations in the disposition of the lecture-room as far as the students were concerned. I think that the provision for the students is very good. We felt that the present plan lent itself to further extension. With a large site of 11 acres it will be possible to go on extending the building in its present form by adding new blocks, and it will be still in harmony with the original portion. We gave some consideration to the matter of building material. As a matter of fact, it is necessary to decide upon the material before you design the front of the building, the matter was discussed at length, but no decision was arrived at. The present design is, I think, the

best for the material which it is proposed to use. The committee gave full consideration to two designs which were submitted to it; one was practically that with which we are now dealing; and the other was rather more elaborate. It was quite appropriate with rather a Spanish feeling about it. We felt that such a design was an appropriate one to carry out in synthetic stone owing to the repetition of rich ornaments which would be possible in synthetic stone, but which would be very costly to carry out in natural stone. Other things being equal, we should no doubt prefer to use natural stone. The committee recommended that, with the simpler design, stone from Gosford or Hawkesbury should be used. We were informed that it could be landed at Canberra at a quite reasonable cost. The committee was satisfied that such stone would be rich enough in appearance for the frontage. It is not really a city building, but will be in an open space, and surrounded by trees, and it should, therefore, be simple in its treatment. To most people looking at the building, it would be just a light-coloured structure amongst the trees. Personally, I should prefer to use Hawkesbury stone for this particular building, and I think that the other members of the committee will agree with me in this. The Gosford stone is rather cold in appearance; it is grey rather than cream coloured. I prefer the less cold colour of Hawkesbury stone. I am aware that this building is really part of the University group, and I trust that the University buildings will be of the same type. They also will be set in rather a large area with plenty of greenery about them. I was surprised that it should be possible to obtain natural stone at Canberra for the price quoted, and that was why the committee at first felt that it might be necessary to use brick and stone. However, if stone can be used for the outside facade, it is to be preferred. There is ample Hawkesbury stone to build the Museum, and later, if necessary, to build the rest of the University group as well. The Federal Capital Commission appointed five architects as a Committee of Public Taste, and the plans for this building were the first submitted to it. The Commission is evidently endeavouring to get the best outside advice it can on its buildings. Personally, I think it is an extraordinarily roundabout way of doing things, and it is absurd to waste so much time and money in travelling expenses. It is necessary to bring five men together, some of whom live in Sydney, and some in Melbourne, in order to spend one morning in looking through some plans. Why, the building could have been finished in the time which has been wasted over these plans! The plans have to be drawn out before anything is done, and it is such delay and repetition which make the Public Architects Branch cost 8 per cent. of the cost of construction. Less elaborate plans might have been prepared in the first place; but, as a matter of fact, I do not think it is the business of the architects' branch to design buildings at all. It should be there to pass judgment on plans submitted to it by outside men, and to co-ordinate building operations throughout the whole city. At present there is not a man in the employ of the Federal Capital Commission who can do that job in a manner worthy of the Capital of Australia. It requires a man of the highest ability whose services would be worth £10,000 a year. There is no master mind in Canberra at the present time capable of directing the building of the city as a whole. That, I know, is a serious thing to say. If one studies the history of the operations at Canberra one sees that it is a record of committees and minority reports, and some one finally has to make a decision. The result is that there is no building in Canberra that one would advise a student of architecture to go and look at, even after £10,000,000 has been spent. We ought to know exactly what we hope to build in 50 or 100 years' time. So far as I know, there is no such

definite plan in existence. In my opinion, if the £10,000,000 had been properly spent, there would have been a delightful nucleus of city from which the complete city would grow, and there would be no suburbs which are the diseases of modern towns. I should have brought it all together into a compact, well-designed little town. The distances in Canberra are out of all reason. I could show the committee the plan of other cities, including Washington, in which it will be seen that there are not in them such enormous distances and spaces as there are in Canberra. The greatest space between buildings in any of the cities which I have in mind is about 500 feet. It is ridiculous to have such enormous spaces between the public buildings, and then to have the whole thing surrounded at still greater distances by clumps of little suburban cottages. The instruction to the late Advisory Committee, and later to the Commission was to get Parliament to Canberra, and they did it efficiently; but that was not making a city. To make a city there must be a single master mind, the generalissimo directing operations. It might be possible to carry the work out through a small committee, but, personally, I think it should be done by one man. If there are three, there must be compromise, and plans must be watered down. In the past, there may have been men who had the right ideas. Griffin may possibly have had the right idea himself. He drew the present Canberra plan, it is true, but I cannot believe that he ever meant building operations to begin on the outside of the circle, and work towards the centre. I do him the credit of thinking that he meant operations to start at the centre and spread outwards. It is all very well to talk about temporary buildings at Canberra, but we know that most of the buildings that have been erected will stand for the next 100 years. It is a thousand pities that the idea of Sir Edwin Lutyens, Sir Herbert Baker, or Sir Louis de Soissons, or of Mr. Lancaster was not taken on this matter. The almost invariable experience with committees is that when it is discovered too late that something should have been done, each member of the committee will say that he proposed that very thing, but was over-ruled by the other members. The trouble with a committee is that the vote of the best man on it is of no more value than that of any other member. The opinion of a minority of a committee, unless it be entirely composed of specialists, of equal skill, is more likely to be right than that of the majority. Fewer people know than do not know. I should like to know what this particular building has cost already for draftsman's expenses, architect's fees, &c. I should say that already those expenses have made a big hole in 6 per cent. of the construction cost, and the building has not yet been started. Private architects do not receive any remuneration for such preliminary work. They make sketch after sketch, and do not get anything for it, unless the client changes his mind, and does not go on with the work. I suppose Mr. Morris, who prepared this plan, met Dr. MacKenzie, and discussed the matter with him; but we do not know what Dr. MacKenzie wants, except through Mr. Morris. I admit that this is a beautiful site, but I think that it is quite wrong to erect any building which is not part of the nucleus of which I have been speaking. I would have the building near a central group which would represent the heart of the town; something to which visitors could drive, and stopping before it, say, "Here we are at Canberra." I would not spend a penny of this proposed outlay on the present scheme, unless I think it is wrong, more especially as it is proposed to put the building a mile away in the bush. Even at this stage, I think it would pay the Government, and the people of Australia, to appoint one qualified man to take com-

plete charge of the building of Canberra. Money would thereby be saved, and much of the organization which is at present there could be disbanded. We have heard something about the foundations of buildings in Canberra, and the number of accountants who add up figures over and over again. That is simply playing with the thing, and is wasting my money; that is why I am interested in it. I should not agree to the erection of a single extra building in Canberra that is not part of a single co-ordinated scheme. What, for instance, is the idea of creating a Civic Centre a mile away from Parliament House? Why not build a square, and use the buildings for what they are wanted now, and get a city built? It is not the duty of governments to create buildings. They use buildings, but they do not create them. At Home they have building surveyors, but they would not think of designing or erecting buildings themselves, much less of trading, and selling cement to the contractors. That is an awful thing. As I have said, I have only seen these plans this morning, but I know the main lines of the scheme, and if it is decided to erect such a building, I think this design is satisfactory. The sky lighting should be changed, however, as otherwise the heat beating into the room would be too great. The lantern system of lighting should be employed. This would not detract from the external appearance. I do not approve of the proposal to employ wooden posts in the cloisters round the courtyard. These posts should be made of concrete cast. The cost would not be materially greater, and money would be saved, because there would be no expense in maintenance. With the exception of the glass skylight, and the wooden posts of the cloisters, this plan is quite satisfactory, but I hope that it will not be built.

11. To Mr. Cook.—I do not think that the plan which was prepared prior to the one which we are now considering was a good one. In the first place there was no main entrance, and, in the second place, the planning of the lecture room was such that the lecturer would have to stand facing the windows. Anybody should know that a lecture room should be designed with side lighting, and a blank wall opposite the lecturer. The plan also provides for a big east line, which makes for a costly building. You cannot get an effective building with all these breaks in the outside line. The elevation has a Canberra touch about it; but it is not what we should admire. There is a minor central mass with a blank in the middle of it, and two bigger flanking masses that are killing and overpowering it. I do not even think that it would be more economical than the present plan. I did not give evidence before the committee on the old plan, and the first time I saw it was when it came before the Public Taste Committee. If the accommodation is the same, I think the amended plan would be cheaper than the other. The committee felt that as it was an isolated building, it would be impossible to have a front in one material and the back and sides in another. Rather than have that, I should prefer to see the whole building in brick. I should like to see the outside facade in the amended plan faced in stone. Situated as it is amongst the trees, it is very important that the building should be light in colour. The suggestion for the amended plan came from the Committee of Public Taste. Even if the amended plan were to cost £10,000 more than the other, I should still prefer it, but I do not see why it should cost any more. Without going into the matter thoroughly, it is difficult to express an opinion on it. I am of opinion that the same accommodation could be given with the present design as in the design which was formerly submitted, and for the same cost. If I were spending my own money on the job, I would undertake to erect the building for £60,000, even if it were necessary to make it a little bit smaller.

I know nothing of the value or the extent of the collection which it is proposed to house, but if, as I am assured, the Americans are prepared to give £100,000 for it, I should accept the offer to-morrow. I am very surprised to hear that this building is estimated to cost £80,000. As a matter of fact, I thought the price was to be £50,000 or £60,000. I am sure that we could erect it in Sydney for that amount. I have erected buildings in Sydney half as big again as this for £70,000. If the cost of this building works out at 3s. 8d. a cubic foot, it is a terrible price. For my part, I should not favour spending more than £80,000 on such a work. It would be possible to build a factory, providing the same area as this, for a few thousand pounds. The museum does not need to be an elaborate building; it is not desirable to distract the attention of visitors from the exhibits. I would undertake to design a suitable building which could be erected for £80,000. It would not be quite the same as this, but I think it would be just as good. I am very surprised to learn that the time of members of this committee has been spent on the consideration of a plan other than that which is now before it, and I am surprised that such a plan should be produced by the department. The long "coast line" provided for in that plan is most extravagant. It was the action of the Federal Capital Commission in submitting the plans to the Committee of Public Taste that was really responsible for the alteration in the whole plan. To me it seems extraordinary that the Commission's proposals should be engaged on this work at the same time that the architects of the Public Works Department were working on it. Apparently one of the officials of the Public Works Department also prepared and sent in a plan. I do not know whether he did the work in his own time; but if he did not, it represented the waste of more money. They should have decided between them who was going to do the job. The Committee of Public Taste has never been asked to submit an opinion upon the layout of Canberra as a whole. The committee dealt with applications for the position which Mr. Morris now holds in the employ of the Federal Capital Commission. We have never been told anything of the plans of the Commission, and it is merely isolated matters upon which our opinion is asked. When we were asked to advise on the applications for the position which Mr. Morris now holds, we practically turned them all down, yet some one was appointed without reference to us at all. I am of opinion that the department should take more care in the selection of witnesses from whom evidence on important matters is sought. I have never been able to discover why some witnesses are called, and why others who should be called are not. I must take a professional man to be able to weigh the value of a witness' evidence on a technical point; otherwise you may get a very eloquent man who may sound well to the layman, but who knows nothing about architecture at all. The Committee of Public Taste, which consists of Messrs. Godsell (chairman), Waterhouse, Henderson, Blackett, and myself, was very surprised to learn that it was proposed to erect this building right on the outskirts of the city, in the middle of an 11-acre block of land. We were not unanimous in our objection, but three members were against it. One of the other members thinks that everything is lovely, and the other goes with the majority. If one were to give marks to the value of the votes, there would be a big majority for not scattering Canberra buildings any more.

12. *Mr. Sturtevant.*—I am certain that if competitive designs had been called from private architects it would have been possible to get a cheaper and better building than the one which it is now proposed to erect. Moreover, the architect winning the competition would have taken charge of the erection of the building. The

usual commission to architects is 6 per cent. I object to the division of the commission into proportions for preparing the plans and supervising the work. The only reason for mentioning it is that in case tenders are called for the job and the work is not proceeded with, the architect may be rewarded for his work to the extent of a 3 per cent. commission. An architect usually considers that he is entitled to half the commission when the contract is let, and the other half as the work goes on. I am of opinion that it is much better to have one man responsible for work of this kind than to have the supervision rest with the Commission. The Commission should not create a single building. It should receive them from the architects, and somebody, not the present Commission, but somebody else, should have the power to prevent the erection of buildings which would be out of harmony with the general design. Competitive designs should be called for all important public buildings in Canberra. It would be better architecturally, and it would be cheaper. If it costs the architect more than 8 per cent. to prepare the plan and supervise the erection, he is not going to make much profit out of the job. By calling for competitive designs you can get the best plans from the whole of the Commonwealth, and from outside if need be, and you are going to save the upkeep of a permanent establishment in the Commission office. Such an establishment is quite superfluous, and one cannot expect to get the best brains of the architectural world in a permanent official position in Canberra. I do not know whether any advantage would be gained by calling for fresh designs for this building at the present juncture. These plans are now more or less well known to a good many people, and they represent probably the best solution of the problem. They have already cost a good deal of money. The rooms and accommodation, &c., would have to be specified in calling for designs, and it is probable that you would get very much the same sort of design as the one we have here. In pointing out the advantage of competition, I should like to say that all doubts would have to be resolved beforehand. The client has to make up his mind as to what he wants in regard to essentials. These are given to the architects, and from the number of designs received, the best can be selected. The Committee of Public Taste was told that this building was designed in accordance with Dr. MacKenzie's views as to what he required to house his collection. I presume that the design is altered so as to provide more accommodation at the instance of Dr. MacKenzie himself. I can understand the building costing more if the accommodation is increased; but the alteration to the front of the building should not cost any more. I think that the present facade is superior in every way to the old one. It is a modern, interesting treatment. There are no worn out features of the old world, and it strikes an interesting note. The less run of exterior wall required to enclose a given area the cheaper the building will be. I prefer high side lighting or lantern lighting. It is necessary to obviate the direct rays of the sun shining down into the room. Such direct rays are too hot, and might also affect the exhibits. It is possible to get the same lighting with high side lights as with skylights. High side lighting would be clean, cheap, and an improvement in every way. I do not think that it would be possible to remodel the interior of the building so as to cut down costs; but it might be possible to effect economy by simplifying the finish. It is not necessary to have ornaments at this building. Much of the interior consists of workshops, and these should be kept as workshops. For this building I do not think there would be much difference in the cost between natural and synthetic stone finish. Natural stone would, perhaps, be cheaper. It is only when there is a great deal of rich ornamental work to be done that synthetic stone has any advantage from the point of

view of economy. If there were rich work to be done on this building I should combine the two methods of treatment, doing the plain work in natural stone, and the rich work in synthetic stone. Beyond what is laid out in the Griffin plan of Canberra, I do not know what is supposed to be done with the vacant land surrounding Parliament House. The Griffin plan shows government buildings on terraces stretching right down to the water. It may be true that the Griffin plan is being adhered to, but I do not think that the plan, in the course of the order in which the parts are to be built, is being adhered to. It is my opinion that Griffin never intended to build suburbs as one of the first parts of the city. I recognize that the civil servants had to be housed, but I would house them in modern two-storied buildings half a mile from Parliament House, and would have something like a town built. I submitted some plans in the competition which was called, but the winning one was for Melbourne suburban cottages. I would have the effect of producing a town, and not a series of scattered estate agents' suburbs. The Works Department had already built cottages at Canberra, and as an adjudicator was a departmental official, the winning competitors very shrewdly submitted similar designs, and the department simply went on building the same kind of cottages. In my opinion, the building which we are now considering should be one of the last to be erected. Personally, I hope that it will never be built. We were not consulted in regard to the site. We were told that the building was to be put in a certain place, and our opinion was asked on the building alone. In place of the present Commission, I should suggest one, either with a layman as chairman, and the other two consisting of an engineer and architect; or, alternatively, a commission with an architect as chairman. An architect is trained to co-ordinate the efforts of a number of professional men and craftsmen. It is wrong to put an engineer in charge of the Commission. Running Canberra is one thing, and creating first class architecture is another. As for the architectural development of the city, I am convinced that it is necessary to have a master mind in charge to decide what should be done. At present nobody knows what is actually being done. The Griffin sketch plan was made in Chicago many years ago, and it has never had the chance of being properly developed on the site. I have never seen a plan of what it is proposed actually to do, but I do not think any such plan has been evolved. The Griffin plan of the university shows 31 buildings, each about 400 feet by 200 feet. Even if they were built they would not produce anything charming. Doubtless he would say that they were only little, tentative sketches; but they were, nevertheless, drawn to scale. I hope that there will be a university at Canberra; it will never be a manufacturing city in any case. Let it be a governmental and university city. If we can bring from every State young university men to Canberra to spend three years there, what a fine thing it will be for federation. It will help to break down State feeling. Recently I have been working out the cost of the buildings at the Sydney University. The estimates submitted to you in connexion with this museum at Canberra range from £154 to £245 a square. Within the last eight years important buildings have been erected at the Sydney University at an average cost of £140 per square, including elaborate stone, fire-resisting buildings at from £130 to £170 per square; and work in brick and stucco as low as £62 per square. The large physics building, which is comparable to the museum under discussion, with a good deal of stone, fire-resisting floors, &c., cost £117 per square; while the additions to the main quadrangle entirely in stone cost £150 per square. Some of these buildings were erected in 1921 and 1922 when costs were at their

very highest, at a cost of approximately 1s. per cubic foot. I am afraid that it is optimistic to say that building costs are only 10 per cent to 12 per cent. higher in Canberra than in Sydney. I should say that they were nearer 20 per cent. higher.

(Taken at Sydney.)

MONDAY, 10TH SEPTEMBER, 1926.

(SECTIONAL COMMITTEE.)

Present:

Senator REID, Chairman;

Mr. Cook Mr. Seabrook.

Bertrand James Waterhouse, F.R.I.B.A., M.I.A. (New South Wales), and Trustee of the National Gallery of New South Wales, sworn and examined.

13. *To Senator Reid.*—I have seen the plans for the Institute of Anatomy which it is proposed to erect at Canberra. As a member of the Committee of Public Taste, I have had opportunities of discussing the plans with other members, and with members of the Federal Capital Commission. When I was at Canberra I inspected the site of the proposed building. Several sketch plans were submitted to our committee, and different ideas were discussed. The general opinion was that the open type of plan would be more flexible. I gather that the suggestion for a "U"-shaped building, making provision for extensions on the western side, has been adopted. The committee felt that such a plan would meet the present requirements, and be suitable for future development. Buildings must grow. Unless provision is made for extension at the beginning, one gets a haphazard effect which should be avoided at Canberra at all costs. I presume that the plan now before the committee meets with the requirements of Dr. MacKenzie. The museum space is divided into two groups, and that, I think, is a definite advantage. Sums varying from £65,000 to £75,000 were mentioned as the probable cost of the building. We had an idea that the previous plan, at a cost of 3s. a cubic foot, would run into something over £70,000. We were rather concerned as to whether the value of the exhibits to be housed warranted so much expenditure; but we were not asked to express any opinion as to that. My view is that a building of this character should be considered in relation to the university buildings, which will be built there later. This building will then, no doubt, become a portion of the university buildings proper. Therefore, it might not be wise to erect so expensive a building on so valuable a portion of the site, which might later be required for the main university building. If this building were considered in connexion with the whole university scheme, it might be possible to design a cheaper structure that would serve the purpose for which it is intended. Zoology is not the most important part of the work of the university; yet the building for this work is to be given the most important position in the whole site. So far as I can see, this building has not been considered as a part of the university scheme at all. However, the committee was not consulted in regard to the site, but only in regard to the building. We admitted that it was a very fine site. We asked, when we were in Canberra, whether a portion of the university site could not be used for this building; but we were told that this could not be done, as it did not meet with the wishes of the persons in authority. Personally, I think that this is a great pity. This proposed site is a most valuable one, looking right towards Parliament House, and might, with advantage,

be occupied at a later stage by a building of greater size, and one more in harmony with the general lay-out of Canberra. We were not asked to consider this building in any such light; but merely to say whether we thought it to be appropriate for the particular purpose for which it was designed. From an architectural point of view, its merits were to be considered only in relation to itself. There was a feeling that a building of a simple type would be attractive, and not inharmonious in relation to anything else which might be built later. Moreover, a building occupying so prominent a site might well be the keynote of the university buildings themselves, but the question arises, is this building of such a type as to form a satisfactory keynote for a vast mass of buildings to be erected later? The individual views of the members of the committee were collated by Mr. Godsell, and forwarded to the Federal Capital Commission. I take it that the utilitarian character of the building has been determined in consultation with Dr. MacKenzie. Top lighting is quite customary for rooms of this kind, and in this particular instance the position of the rooms suggests that it would be wise to retain top lighting. If this system of lighting is employed, it must be efficient and simple, and easily controlled and regulated, and must be considered in relation to ventilation for a room containing 160 people. If no mechanical system of ventilation is to be installed, the system of top lighting and natural ventilation must be considered in relation to the supply of fresh air, and the outlet for vitiated air. We had hoped that plans in a more developed, tentative, stage would be submitted to us suggesting the type of lighting to be used, and the system of ventilation; but, since the general lay-out was evolved, we have had no opportunity of seeing it until the working drawings were placed on the table before me now. As to the possible over-heating of the building as the result of roof lighting, that must be guarded against by the form of roof used. An art gallery, for instance, has to be lighted that way, and the problem of overcoming excessive heating has to be faced and dealt with. The difficulty has been overcome in many structures. In the Art Gallery in Sydney, it is all top lighting. The room is 26 feet high, and the ventilation is quite good. The actual roof rights are covered with lantern lights, so that the light is not direct into the gallery, but is diffused all through it. The height of this museum room should be sufficient to allow of indirect roof lighting. It is merely a question of efficient ventilation. It was suggested to the Committee of Public Taste that the exterior of the building should be finished in stone, and that the remainder should be of brick finished with cement. We felt that this was desirable, and the matter, therefore, resolves itself into a question of the type of stone that should be used. I consider that a light-coloured stone would be preferable on account of the general drabness of the country at Canberra during the dry part of the year. Hawkesbury sandstone seems to be the most favored for such a purpose. I have been rather impressed with synthetic stone, and its use might be considered seriously by the Federal authorities. It has been largely used in other parts of the world. I had some samples sent out from England a year ago, and forwarded them to the Federal Capital Commission, with particulars concerning them. So far as I know nothing has been done to investigate the possibilities of synthetic stone. It will stand all the varieties of treatment that natural stone will, and it has been proved to be permanent. It is eminently suitable for moulding and carving. The matter resolves itself, then into one of relative cost. Trachyte is about 7s. a cubic foot; granite 12s., and sandstone 4s. 6d. a cubic foot. In England various artificial stone companies were delivering the stone on to building sites, moulded and ready for being put

into position, from 9s. to 15s. a cubic foot. I take it that we have the aggregate available from which synthetic stone might be prepared, and it seems, therefore, worth while to experiment in its use. Our committee considered the matter of using sandstone as against synthetic stone, and we felt that, where a natural stone could be found of a suitable texture, it was to be preferred. My own objection to Hawkesbury stone is that it is too cement-like in colour. It has a fine, close texture, but looked at from a distance it becomes merely a cement finish. Gosford sandstone has a better colour. For Canberra I should prefer a stone that has some life and colour and warmth about it. If it is not too red or too grey in character, the mass of the building carries, and on a closer view you get that charm of texture which constitutes one of the attractions of a building. The price per cubic foot of a building depends largely on the finish which is required. One room might be just plastered or paneled, while another might have a more elaborate style of finish. This would affect the cost per cubic foot. Some of us thought that 2s. 6d. or 2s. 9d. would be a fair price for Canberra; but others thought that it might be as high as 3s. If it can be done for anything in the vicinity of 2s. 6d. it is a reasonable price. I am informed that the first estimate for the building was considerably lower than the estimate for the plan which is now before the committee. That should be explainable. One of three things must obviously have happened. The building must have been increased in size, the finish must have been changed, or the original estimate must have been wrong. In considering whether it would be possible to reduce the cost of the building, and at the same time make it fulfil its purpose and be worthy of Canberra, it is necessary to know whether the building has been designed in conjunction with Dr. MacKenzie so as to provide adequate space for housing his collection. We gathered from Mr. Morris that the present area of the museum might be regarded as the minimum. We asked whether such a large area would be required for the museum, and again we were told that nothing less would suffice. Therefore, unless we mutilate after the structure, and reduce its cubic content, it is difficult, if we retain the stone finish, to cut down the cost very much. Unless we impair the utility of the building, I do not see how the cost can be materially reduced without altering the design. The committee did not consider the question of heating; but we assumed that such things as vacuum cleaners and ventilating appliances would be provided in the specifications, or would be covered by separate estimates. I should think that £5,000 would be a reasonable amount for heating.

14. To Mr. Cook.—In answer to the question as to whether, in the present state of the national finances, we are justified in taxing the people for such a building as this, I reply that it is largely a matter of meeting a demand for some specific requirement. If it is really necessary to house some valuable collections, or to provide an opportunity for carrying out research work of great value to the community, then I consider that expenditure of this kind is amply warranted. If on the other hand, the value of the exhibits to be housed is not very great, perhaps a simpler structure on some other site would do for the time being. I should not recommend the placing of this building on the proposed site unless it were considered in relation to the whole university scheme, and to the general layout of Canberra itself. I know that the general layout of Canberra according to the Griffin plan, has been followed, but I consider that a re-survey should be made of those areas not yet developed, so that all buildings yet to be erected might be in accordance with a general plan. Nothing has been suggested as to the future surroundings of this proposed building. The moment

you put up a permanent building you limit the use of that area to a specific purpose, and it should be in harmony with other things that are to follow later. I maintain that the most important structure of the university should occupy the most commanding site, and I do not think that this building is the most important part of the university. In Sydney the main buildings of the university span the main ridge facing east, and behind them are the other subsidiary buildings. I cannot conceive of zoology ever becoming the most important part of the work of a university. This site is an ideal one for the principal administrative and controlling buildings of a future university. A suitable building for this purpose could be erected somewhere else for less than £85,000, provided it was to be considered as part of a definite university group. But I do not think that another site should be chosen, and another building designed, just to save a little money. A plan should be prepared for all the university buildings. If it is determined to place a zoological museum on this particular site, I should rather that the style of building shown in this plan be extended than one of less cost; but if another site not so outstanding was chosen, a building of lesser cost could be erected so long as it was part of a definite scheme. The most prominent part of a university would be the administrative and lecture rooms, which would face the main entrance. It would contain in its wings parts which would be used for purposes other than administration, but they would still form portion of the central group. The clerical staff, the registrar's office, &c., would be housed in the central block, and the other parts would be taken up for technical purposes. If the authorities determine to erect this structure on this site, I have in mind an almost equally suitable site for the main portion of a Canberra University. This site is almost immediately behind the one we are considering. It is a large area, and will lend itself to a comprehensive lay-out. It has, perhaps, the disadvantage that the main focal point towards one side would be occupied by this particular building. I recognize that a gift such as that made by Dr. MacKenzie to the Commonwealth Government is an important one, and should be properly housed, but the proper housing of this collection should not be allowed to interfere with a general building scheme for Canberra, or for a future Canberra university. The prices for this building mentioned to the Committee of Public Taste ranged from £70,000 to £75,000. It is very difficult to make a definite comparison of building costs between Canberra and Sydney, because the types of buildings vary so much. I do not suggest that this building should now be thrown open for competitive design. It is not a very monumental building, being more or less technical in character, designed to meet the requirements of Dr. MacKenzie. An architect of the commission could design a building which would be quite suitable for such a purpose.

15. To Mr. Seabrook.—The Institute of Architects of New South Wales has not been consulted in regard to this building. For anything of an important or national character we are of the opinion that competitive designs should be called for, but I do not consider this building to be of such a character. It is an important building, it is true, but it is of such a special and technical character that I do not think you would get many varied ideas if you did call for competitive designs, but competitive designs should be invited for the whole University group. It would depend on the type of finish as to whether there would be room for much variation in the price of such a building as this. Once the finish is known it would be possible to take out the quantities required, and these, reckoned according to the current cost of building in Canberra, would give the price for which the building could be erected. The principle of

building is wrong for a building like this. The quantities should be taken out, and we should then know definitely the cost of the structure. I consider that, as a result of the alterations which have been made, the plan has been improved both from an aesthetic and utilitarian point of view. It is a simple, cohesive type of building which will serve its purpose well. The original plans which we saw were more elaborate than this. The present plan is an improvement on that which was previously approved by the Public Works Committee. I think that the new plan is well worth the additional cost. Mr. Morris, who is responsible for the plan, is an associate of the Royal Institute of British Architects, and a member of the Institute of Architects of New South Wales. He is also a winner of a travelling scholarship, and is a capable man. If competitive prices were called, and the work was handed to a private practitioner to carry out, I think it would be done cheaper. It appears to me that the cost of preparing the plans and of supervising the work in this case, will be in the vicinity of 12 per cent. of the cost of construction. In the case of private practitioners all that work must be done for 6 per cent. As a rule, we work to get 21 per cent. profit for ourselves after our out-lay. I am of the opinion that all work would be very much better placed in the hands of private practitioners. With the vast amount of architectural work being done at Canberra it is lamentable to think that one of the most important functions of the Commission is being neglected. No private client would undertake a building costing £100,000 without engaging the services of an architect. In the case of Canberra, however, we have a controlling body spending millions on which there is no engineer and a builder, but not an architect. If Canberra is to develop as it should, a competent architect should be a member of the Commission. There would be no need then to appoint a Committee of Public Taste, and as we are to render all the assistance we can. The architect in charge of the Commission should control such things as the lay-out of roads and subdivisions. Unless that is done, I fail to see how it is possible to obtain any cohesion in the work done. As a result of the present lack of unified direction, we have in Canberra a collection of ugly buildings, ugly little churches, and a confused lay-out. Every plan as it is designed, both departmental and public, should come before the controlling architect, and it should not be erected unless it receives his approval. By those means it would be possible to achieve something of a definite architectural value. There are buildings in Canberra which are far worse than any you will find elsewhere. In other parts of the world, town-planning is carried out scientifically. In Canberra millions of pounds are being spent, and we are getting nothing out of it architecturally. I do not know whether Mr. Morris is permanently employed by the Commission, or has been engaged merely to do this particular job. For this building I should favour the installation of the clerestory lighting system, or a high range of windows. Such a system makes for easier ventilation, and is more simple to maintain than is the lantern-lighting system. Synthetic stone appears to be more expensive than Hawkesbury stone for this building, but I am surprised to learn that it should be so. It may be because the manufacturers here are not yet accustomed to the manufacture of synthetic stone. In London it has been proved that it can be made cheaper than Portland stone can be quarried and used. If it can be done in London, I do not see why it cannot be done here. It would be cheaper to manufacture synthetic stone near where the aggregate can be obtained. I have not seen the Fairy Meadow stone, but if it is a crystalline limestone, it should be a suitable aggregate. It seems to me that the transport of Hawkesbury stone to Canberra must be very heavy,

and would increase greatly the cost of building. If it is possible to get the right colour and texture, one would always prefer natural stone to synthetic. Even if I were doing this work for myself I should be governed by the relative cost of the two materials in deciding whether to use synthetic or natural stone. I observe by the estimates which have been prepared that the building can be finished in natural stone for less than in synthetic stone, and, therefore, I should certainly favour the use of natural stone. I prefer a brick backing because it is simpler than concrete. By using brick, you save the cost of wooden forms, and the bricks are available at Canberra. Wire-tying has been adopted in Sydney for fixing on the stone facing, but I do not approve of it. I believe in bonding it in. With the wiring system, if the weather gets through, the steel will oxidize, and trouble will inevitably follow. If it is true that in choosing the proposed site for this building, consideration was given to the university buildings which will later be built and, also, to its relations to hotel accommodation, &c., for students, I can only say that this is the first I have heard of it. If it is considered that the present proposal is satisfactory from these points of view, it may be all right, but it occurs to me, that if the whole university scheme were napped out, it might be possible for some economy to be made in this building. This is an expensive building because, on account of its prominent position, it is necessary to face it in stone. If it were with a number of other buildings behind the main group, perhaps a simpler building would suffice. I do not think the urgency of the case should preclude the consideration of the whole scheme, particularly when money is so scarce.

The witness withdrew.

George Herbert Goddell, F.R.I.B.A., President of the Board of Architects of New South Wales, sworn and examined.

16. To the Chairman.—I am the Chairman of the Public Taste Committee appointed to consider plans of proposed buildings for Canberra. In conjunction with the other members of the committee, I examined the plans for the Institute of Anatomy, and forwarded the following report to the secretary of the Federal Capital Commission—

E.S. & A. Bank Chambers,
Sydney,
30th July, 1928.

C. S. Daley, Esq.,
Secretary, Federal Capital Commission,
Canberra.

DEAR SIR,

RE INSTITUTE OF ANATOMY, CANBERRA

I have pleasure in complying with the request contained in your letter of the 21st inst, asking me to prepare, as Chairman of the Committee of Public Taste, a report confirming the conclusions arrived at by the committee in respect to the proposed Institute of Anatomy, Canberra.

I report as follows.—At the invitation of the Chief Commissioner, the committee consisting of Professor Wilkinson, Mr. Waterhouse, Mr. Blackett and myself, met in Sydney to consider three sets of drawings for the above-mentioned building.

Two groups of drawings were prepared by the Department of Works and Railways in Melbourne, and a third set by the Federal Capital Commission.

It was understood by the committee that the amount of money to be expended on that portion of the building now to be erected, was not to exceed the sum of Seventy-one thousand pounds (£71,000).

It was also explained to the committee that the drawings represented by No. 1. Group were those considered by the Parliamentary Standing Committee on Public Works, and that there was a recommendation that the front elevation should be finished in sandstone, and that the other elevation might be finished in brick work with sandstone dressings.

After giving careful consideration to Group Drawings No. 1 and 2, the committee was unable to recommend same, but considered that drawings submitted under group 3 were the

most suitable and with some alterations would meet the case, and, in respect to the treatment of the external elevations, I recommended the use of Gosford stone (not Hawkesbury River stone).

Suggestions were made to the designing architect to the Commission, who was present, with regard to the alterations in the plans, which the committee considered would improve the general layout of the scheme, and the committee also requested that the plans should be re-cast and re-submitted for further consideration.

The committee decided that the next meeting in connexion with this matter should be held in Canberra, in order that the site might be viewed at the same time that the amended plans were considered.

The second meeting of the Committee of Public Taste in respect to this matter was held at the Commissioner's office at Canberra on the 9th June, the following members being present:—Professor Wilkinson, Mr. B. J. Waterhouse, Mr. Blackett, Mr. Henderson and myself.

The site was inspected and the aspect of the building generally considered. When consideration was given to the plans it was suggested that a central quadrangle treatment should, if possible, be maintained, and that Dr. MacKenzie should be approached in order to ask him to agree to two smaller museums being provided in lieu of one large one, and placed at either end of the main block, in order to provide a central quadrangle with a cloister completely around same, providing approaches to the museum.

The elevations by the designing architect generally, were approved and it was suggested that the facing of the whole of the structure fronting on to the quadrangle should be finished in cement.

On 24th and 27th June meetings were held in Melbourne, and I understand that the Commission's designing architect consulted Mr. Murdoch, Director of Public Works, also Dr. MacKenzie and Mr. Owen, and as a result I received a telegram informing me that the approval of the scheme by the Committee at Canberra had been confirmed.

I have now received from the designing architect the preliminary drawings of the building which are upon the lines suggested by the committee, and are satisfactory.

I note that synthetic stone has been suggested for the external elevations. I think that the committee's view is, that where a building is a monument in character, manufactured materials representing sandstone or terra-cotta are generally undesirable.

The committee would like the opportunity of inspecting the working drawings when same are completed.

Yours faithfully,
(Signed) G. H. GODDELL.

I have had a letter from the secretary of the Commission asking me to confirm the use of synthetic stone. After consulting the members of the committee, I replied that only one member of the committee was in favour of using synthetic stone, and the remainder favoured natural stone. Where you have a monumental building such as this, it is best to use material indigenous to the State or locality. For such a building as this, it is not justifiable to use a manufactured material when natural sandstone can be obtained at a greater cost. In Melbourne, for instance, there is a notorious bluestone which suits the Victorian climate admirably. It is probably the result of pre-historic conditions and, therefore, suitable to the climate in which it is found. A beautiful sandstone is to be found around Sydney, but there is a better class of stone altogether at the Hawkesbury River. I do not wish to draw comparisons, or to start a discussion on the merits of one stone as against the other, but my experience is that I built Farmers of Gosford stone, and a more beautiful texture it would be impossible to find. Compare that with David Jones' building where you can find vegetable matter in the stone itself. It is of a different colour, also, and does not hold its texture as the other stone does. Gosford stone is soft when it first comes out of the quarry, but it hardens in the weather. Note on Farmers' building how beautifully the pilasters on the columns are carved. This stone is a good material, and it is cheap. I think I am right in saying that it would be possible to land it at Canberra for less than 3s. a cubic foot. The plans which we have now before us carry out the general ideas that the Committee of Public Taste put before Mr. Morris. No doubt when the drawings are further advanced,

some very good detail will be included, but I should like my committee to see them again before they get too far towards completion. When the details are ready, and the general idea of construction has been evolved, I should like my committee to see the plans, because there are men on that committee who might make very valuable suggestions. No matter how much Mr. Morris caught the ideas of the committee, but the plans, when re-submitted, might, I have no doubt, be improved upon, as a result of the special knowledge of members of the committee. Most of us have had big city buildings to do, and one gains much experience from such work. The site on which it is proposed to put this building is a very fine one. We were told about its proximity to the university site. That is why the committee's desire was that two elevations, that to the university, and towards the Acton Hotel, should both be facades. In the first instance the committee thought that the buildings should face towards the north-west instead of towards the south-east, but the members altered their opinions later, and decided that the other way would be better, because it was pointed out that the ground falls away down to the south-east, thus enabling the front of the main block to be raised sufficiently far to get first class basement for storage without having it entirely underneath the ground. By that means it would be possible to secure good lighting, and practically make another floor for little extra cost. The committee considered that when this building was finished it would be in harmony with the finished university building. However the type of buildings for the university may vary, this building should still harmonize. This building and the university are different purposes, and I think that every building should represent the purpose for which it was designed. The university buildings, would, I think, cost more per cubic feet than this. In this building there is a very large amount of voids. For the museum rooms there are only the four walls and gallery, with cement finish, and the roof, so that the cost should be considerably less than for a college where it is necessary to subdivide for students' rooms, and to provide a tremendous amount of plumbing, partitioning, &c., which cost more to install than to erect the actual building. I do not think that the cost of the building can be cut down, and still keep the main architectural features in harmony with other buildings which may be erected later. The only decoration to this building is on the main front. The opinion of the committee is that added ornament not arising out of construction should be of a minor character. The idea should be to make the building monumental, with the aid of good lines. Let the main outline give the reason for which the building is intended. Not very much would be saved even if the building were built in brick and cement, which would moreover, destroy its monumental character. It is necessary to have only a 9 and 14 inch ashlar, even if so much as that is required. The backing would be of brick, and the steel employed should be structural. It should not be an expensive building. I think that the price quoted is reasonable for this class of building. The overall cost should be 2s. 4d. a cubic foot; but 1s. 9d. a cubic foot for the museum seems just about the right price. I should say that 1s. 9d. for the museum portion, and 3s. for the other part would be a fair estimate of the cost for Canberra. Those prices would compare favorably with my experience in Sydney. This is practically a two-story building, with a basement. That naturally costs more per floor than if you were putting up a four-story building. You save money as you go up into the air. Therefore, though I could erect a high building for 1s. 10d. in Sydney, I could not build a two or three-story building for the same price. I do not think that artificial

ventilation will be necessary for this building, provided cross ventilation at the top is provided for. It is possible to get all the fresh air that is needed by means of Tobin tubes. By this means you get an adequate supply of pure, fresh air, and the vitiated air is got rid of by a cross draft at the ceiling level. The whole question of roof lighting needs careful consideration, and I do not think that I ought to express a definite opinion on the system proposed in this plan until I have had an opportunity of going thoroughly into the matter. I think it is probable that a better system of lighting might be devised. It will be found that almost in every case where roof lighting is installed it is necessary to make provision by some means to secure the right light at the right time of day. You may want blinds to draw across, or you may want to close up a portion of the light, and put artificial light in. These matters are determined by the aspect of the building, and by what it is required for. My idea of top lighting is that it is not necessary to carry your lights right across. Lights less than two-thirds of the width of the museum would, in this case, give all the lighting needed. It is a matter which requires careful consideration, however, and this is another reason why the plans should be re-submitted to the Committee of Public Taste. It would be very interesting to hear the opinions of the members. Mr. Waterhouse, Professor Wilkinson, and Mr. Henderson are all able men, and the opinion of Mr. Blackett, of Melbourne, would be especially welcome. I consider that this design is satisfactory from an architectural point of view, and should be suitable for Canberra. After suggesting one or two alterations, the committee was unanimous that Mr. Morris had prepared a very satisfactory plan. I should not favour the use of wooden posts inside the quadrangle. It struck me that the cloisters were a little bit cheap in their appearance. These posts should be concrete columns supporting arches, these to be covered in turn by a flat roof. That would give a beautiful appearance. Of course it would cost a little bit more, and perhaps the architect took that into consideration. I should favour building the piers of brick with an arch opening, together with parapets and a flat roof of plaster. As it is now, it is out of keeping with the rest of the building. It looks like a scullery roof attached to a fine building, not like a cloister at all. In between the piers, I should suggest a low, dwarf wall. These alterations might add about £1,500 to the cost of the work, but it would be justified, I think, because this is going to be a beautiful building if properly carried out. Temporary wooden piers might last for ten years, and would have to be constantly painted and renewed, whereas brick piers would be permanent. I have had no experience of heating by means of air-conditioning plants as against steam radiators, but the idea seems to me to be a good one. If such a system could be installed for £5,000, I should be in favour of putting it in, because it is of service all through the year, keeping the air cool in summer and warm in winter. On the whole, I should say that the plan has more or less carried out the ideas of the Public Taste Committee, and I should like the finished plans to be submitted to the committee so that they may offer a suggestion upon it. If the designing architect met the committee in Sydney, we should be very pleased to give him any advice we could. It would be a good idea if he could meet the committee now, and lay his views before the members so that they might offer advice, which would, perhaps, be the means of saving expense and time when the final preparation of the plans is to be done. Probably the architect could place before the committee what his exact views on the different matters were, and with these views the committee might, or might not, agree. These plans do not give quite enough information as they now are. I am of the opinion that Gosford stone would be entirely

suitable for facing this building. There is no stone I know of which comes so near to English Portland stone as Gosford stone does. It is just the kind of stone which we need at Canberra. At Canberra there are cement buildings painted white, and they are too hard and harsh in the bright sunlight, while they look cold during the dull winter weather. Grey, stone buildings will tone down. That is their charm, and you get the benefit of the texture of the stone. On those portions of St. Paul's Cathedral where the south-west wind and the rain have swept the building, there is a contrast of black against white, which constitutes the great charm of the building. This is especially the case with our monumental building. From my experience of Gosford stone I should highly recommend that it be used for facing this building.

17. *To Mr. Seabrook.*—Altogether, I have seen four sets of plans, but the one which we are now considering is a remodelling of that, which we conditionally approved before. It is really the outcome of the suggestions which the Committee of Public Taste made at the time. I should say that it cost at least £200 to prepare the three sets of plans, and I am sure that it will cost 6 per cent. of the price of the finished work to prepare the drawings by the time everything is completed. I should not like to say that the cost of drawing the plans and supervising the work would be nearer 12 per cent. than 6 per cent. I shall say, however, that in view of the number of drawings that have been made I believe that the cost has been much greater than a private architect could have done the work for. Mr. Morris is a thoroughly qualified man. He is our Australian medallion winner, and I am responsible for his obtaining his present position. The question as to whether I think he is qualified to carry out all the buildings in Canberra, I prefer to answer in this way: Appointments have been advertised in Canberra with which I do not agree. First of all there is a designing architect, and then an executive architect. There are the two sides, the designing and the executive side. If I could not do all the work that has to be done in the drafting office in Canberra with half a dozen men under me, I should want to know why. It is necessary to have good men who are well paid. I should give a man £1,000 a year, and make him work. The trouble is that in a government or municipal office you have one man for this, and another to carry around red tape, whereas a real head should be able to rap out the correspondence, apportion the work to the men, and see that it is carried out. You may have a very good man in a government job, but he has to follow routine, and that is what costs money. This building might, perhaps, have been built cheaper if competitive designs had been called for, provided the architect were allowed by the Commission to carry out his work as he would carry it out for a private client. In that case, I should say it would be undoubtedly cheaper. But if he is bound up by red-tape regulations, has to buy his material from the Commission, and generally be supervised by the Commission, he could not possibly do an economical job, and between them they would probably make a mess of it. The builders can all buy better on their own account than they can get the materials from the Commission. If I said that the cost of a building at Canberra would be about the same as in Sydney I meant the relative cost, taking into account the fact that building costs are materially higher in Canberra than in Sydney. I know that building costs are higher in Canberra than in Sydney, but they should not be so much higher as they have been on some of the jobs here. The present span of the roof in this plan is 52 feet. I should reduce it to 40 feet by means of stanchions on the outside edge of the interior galleries. By doing this we should save a good deal of expansion and contraction, and we should be enabled to have side lighting on the clerestory

principle. I do not think that even an equitable heating system would entirely do away with expansion and contraction of material. It must be remembered that in the summer time even though there is a cool atmosphere inside, it is very hot outside. I have seen steel work in the *Daily Telegraph* office in Sydney come and go as much as 2 inches in 40 feet. That is in Sydney, where temperatures are more equitable than in Canberra. Provision should, therefore, be made for expansion and contraction in such a building as this. In some of the steel and concrete bridges in America, I have seen expansion and contraction take place to the extent of 7 inches. The same can go in buildings in Sydney has been tremendous. We try to protect the whole of the steel work by putting concrete around it, and we protect the concrete where possible with asphalt. The idea is to keep the direct rays of the sun from approaching the material, and thus to keep the amount of expansion and contraction as low as possible. As regards lighting for this building, I should put in a flat ceiling light, and then arrange for my side lights wherever I could get them. I should put plain glass on top, not reinforced glass. If you put iron in such glass, it gets red hot, and breaks the glass. I should favour lantern lighting in preference to ordinary sky lighting. It gives just as good a light, and is easier to regulate by means of blinds. There are times when you must use electric light, and by means of lantern lights provision is made for installing them. I should favour a cement rendering for the inside of the museum walls.

18. *To Mr. Cook.*—I have inspected the site for this proposed building thoroughly. I think that it will be one of the most important buildings in relation to the university, and should be on the best site in the university block. I do not know whether it comes within the scheme for the near future, but there is plenty of room for the university, and the Committee of Public Taste considered that it was a most suitable site for the purpose of such a building. It is difficult to say whether this site might not be regarded as too valuable for this purpose. I can see some point in the suggestion, but I do not think that I have sufficient information as to what the site could be used for beyond this scheme. I should say that the most important part of a university building is the main hall; the other buildings are erected round it. However, the main hall for a university at Canberra will have to be on another site than this, and you cannot regard this building as monopolizing any such site. I do not think that plans 1 and 2 of the three which were submitted to my committee could be seriously considered. They nearly slipped through, I admit, and they were put before us for consideration, but the moment my committee saw them, they recognized that they would not do. I saw them first with Sir John Butters, and I recommended, even before the committee saw them, that another plan should be obtained. I did not think that they were good enough. It is quite true that the Committee of Public Taste was chiefly responsible for having the plans altered. I do not think that this building could be erected for less than the present estimated amount. The estimated price was not previously placed before me as a £20,000 proposition. The price mentioned to me was £71,000. The first two plans submitted to us were really unthinkable. If £60,000 had been spent on them, the money would have been thrown away, because you would not have a good building even when the money was spent. Now you have a building designed on lines that will justify the expenditure. If you get results from the expenditure of money, that money is not thrown away, otherwise it is. The Committee of Public Taste has been in existence for about eight or nine months. This is the first building concerning which we have been consulted. The buildings which have been already

erected in Canberra have practically all been called 'temporary' structures. I cannot say that I am familiar with the design of the proposed War Memorial. I saw the drawing being prepared by Sodersteen, but I have not been consulted in the matter, and have not been interested in it. The committee did not give specific consideration to the question as to whether the site of this building was sufficiently close to Parliament House, but the general view of the committee is that everything in Canberra is too scattered. We believe that Canberra should have been built on a 14-mile square. I am afraid, however, that that would not have been in keeping with the Burley Griffin plan. As it is, however, the place is so scattered that it will be a great many years before it comes together. Seeing, however, the place is so scattered, my committee could not recommend any site other than the one now proposed. I consider that the prices quoted for material for this building are satisfactory. In regard to building operations at Canberra generally, the Public Taste Committee would suggest that a general review of all the buildings which it is proposed to erect in the near future, together with the positions which they are to occupy, should be placed before the committee in order that it might offer comment and suggestions. As an expert, I suggest that this should certainly be done in regard to the proposed university group, seeing that none of the buildings has yet been begun. I should not like to do anything to delay the erection of this particular building, but I do not think that it would take very long for my committee to prepare a report if sufficient information were placed before it. I would not suggest that this building be held up out of consideration for a possible university scheme, but I do suggest that a comprehensive scheme of building be outlined before any start is made. It should not take more than a few weeks, and need occasion no material delay. I can speak on behalf of the committee when I say that it was agnostic at the enormous space that Canberra was spread over. The nearest building of the proposed university block would not be less than 1,000 feet away from this building which we are now considering. Whilst there should be harmony in regard to this building, and those of the university, it does not necessarily mean that they should be in the same style. There is not much likelihood of this building blocking the university view.

(Taken at Canberra.)

TUESDAY, 11TH SEPTEMBER, 1928.

(SECTIONAL COMMITTEE.)

Present:

Senator Reid, in the chair;

Mr. M. Cameron

Mr. Seabrook.

Mr. Cook

Sir John Butters, M. Inst. C.E.M. Am. Soc. C.E. N.I.E. Aust., Chief Commissioner, Federal Capital Commission, sworn and examined.

19. *To Senator Reid.*—When the original proposal for the erection in Canberra of a School of Anatomy and Zoology was brought forward the whole organization of the Federal Capital Commission was working at high pressure in connexion with the transfer of the Seat of Government from Melbourne, and we were unable to undertake either the preparation of the plans of the work or construction. The Director of the school, Dr. MacKenzie, was anxious for the project to be proceeded with, and a design prepared by the Department of Works and Railways was submitted to this committee for investigation and report.

We explained to the committee at the time that we had not had time to study the proposal; but after the committee had reported to Parliament and its report had been adopted, we found opportunity to give close attention to the scheme. We arranged several conferences with Dr. MacKenzie, as a result of which it became clear that the accommodation provided in what had been already approved would not be adequate to meet his growing requirements. We made several suggestions for improving the layout of the building, and they met with his approval. In accordance with our usual practice, our sketch plans for a re-designed building were referred to the Committee of Public Taste, which consists of several of the leading architects of the Commonwealth. After consultation with the committee and Mr. Murdoch, Commonwealth Director-General of Works and Chief Architect, we developed the set of plans which are now before the committee. I may explain that the Committee of Public Taste was appointed about two years ago, as a consultative body to which the Commission could refer all plans for major buildings in Canberra. The members of the committee have been said to act almost in an honorary capacity for the only remuneration they receive is £5 5s. a day and travelling expenses. That allowance cannot be considered as the nature of a fee for men of such eminence in the architectural profession. All the modifications suggested by the Committee of Public Taste and Mr. Murdoch have been embodied in the plans which are now under consideration. The only further consultation with that committee will be in regard to architectural details. This committee may accept the plans now before it as final. Dr. MacKenzie has expressed himself entirely satisfied with the design of the building, and so has the Committee of Public Taste. The general plan will not be altered in any way, but some of the details, such as mouldings and cornices, are not even designed yet, and, indeed, will not be until the project is approaching the stage at which tenders can be called. The arrangements for the lighting of the building from the roof instead of from side windows is a detail that can be adjusted, if necessary, without interference with the general layout now before you. The reason for carrying the roof on a single span is to obviate the interference of pillars with the space in the lecture hall below. The Committee of Public Taste has thoroughly examined these plans and the roof lighting arrangements were fully discussed. I cannot see that any alteration will be necessary in order to get efficient lighting. Dr. MacKenzie has always pressed for this structure as an urgent necessity, and that is why the original project was hurried through in March, 1927. It was not proceeded with at once, because the Commission, as the constructing authority, had to fit this building in with other work in the city, and operations were further delayed through the reduction of the moneys available for expenditure in the Federal Capital Territory in the last financial year. It is true that since this building was first proposed by the committee, the estimated cost has increased from £35,000 to £25,000. One of the reasons is that the accommodation provided in the approved scheme was less than Dr. MacKenzie now regards as essential. His collection has already grown considerably in the last eighteen months, and he expects further additions to it. The plans now before the committee increase the area of building by 10,000 square feet, and the cube by 250,000 cubic feet. The area has been increased from 24,794 square feet to 44,489 square feet. According to Dr. MacKenzie, the building previously designed is already inadequate and would become more so in the eighteen months or two years that must elapse before it could be completed. The plan developed by the Commission gives sufficient room for immediate requirements and is capable

of further expansion. The building will be U-shaped, and if, in the course of a few years, Dr. MacKenzie finds that it is inadequate, another section can be added at the rear. To enable that to be done the back ends of the wings will be left incomplete. This increase in the accommodation of the building itself has meant an extra cost of £9,118. In addition the electric lighting, which was underestimated in the original Works and Railways Department's scheme, will cost another £500; the water and sewerage provision was designed without consulting the Commission, which, having gone into the matter in detail, finds that an extra £637 will have to be spent on that account. The original plan included no provision for fire protection; these appliances will cost £295. Dr. MacKenzie says that he must have a petrol gas plant in the building, as coal gas is not available. The petrol gas plant is estimated to cost £300. The Works and Railways Department's plan allowed only £400 for heating, which, presumably, was intended to provide only electric radiator plants. Dr. MacKenzie says that central heating will be necessary, and for that we have estimated an expenditure of £5,000. Originally no provision was made for an elevator, which the director says will be needed for the handling of specimens. That will account for another £2,000. We have also allowed £2,050 for contingencies to cover the extras which are fairly certain to be required before the building is completed. The Commission has not prepared an estimate of the cost of providing an air conditioning plant, because we do not consider that such a provision would be necessary, and we know from experience that it would be more costly than an ordinary steam-heating installation. The proximity of the site of the proposed school to the area set aside for the university was taken into consideration, and the Commission and the Committee of Public Taste are agreed that the proposed building will not compromise the university architecture or detract from the university site in any way. The designer of the building was recommended by the members of the Committee of Public Taste, and is an experienced and distinguished young architect. He has eminent qualifications as a designer. In considering the criticism of any design, one has to appreciate the fact that architects have their personal idiosyncracies and leanings towards particular styles. Our designing architect is as good a man as we can get, and we are fortified always by the advice of the Committee of Public Taste and Mr. Murdoch, with whom we can consult on any matter. After careful consideration the Commission is of opinion that it is better to get the advice of a group of big architects acting in consultation than to rely entirely upon one architect. Obviously the Commission could not afford to pay a salary of £5,000 to £10,000 a year to attract the most eminent architect available in Australia, and the work of a single architect of lesser standing would provoke criticism from all others. We think we have solved the problem in the most satisfactory way from the stand-point of the public by employing two highly qualified designing architects, and consulting a Committee of Public Taste and Mr. Murdoch in regard to all our more important works. Undoubtedly the Committee of Public Taste renders service of distinct value to the Commission. Our first step is to ascertain the requirements of the authority for whom we are constructing and those requirements determine to some extent the general architecture. Then alternative sketch plans are prepared and we ask the Committee of Public Taste to select from them the best architectural treatment and suggest such refinements or modifications as would improve the scheme. From the results of this consultation the final plans are developed.

20. *To Mr. Cook.*—The Committee of Public Taste did not take the initiative, and point out to the Commission that the original plan was not suitable. The original proposition and two or three alternative plans that the Commission had prepared, were submitted to the committee, which recommended that the treatment shown on the plans now before the Public Works Committee should be adopted. I am not prepared to comment on the why and wherefore as to how it is that a building estimated eighteen months ago to cost £35,000 is now estimated to cost £85,000. The Commission is not responsible for the former estimate. It was not concerned in the original plan, but when it came on the scene consultations with Dr. MacKenzie soon demonstrated definitely that the accommodation provided in the original plan was inadequate. Our duty is to build to the requirements of the authority for whom the accommodation is intended. I understand that the original plan represented Dr. MacKenzie's estimate of his requirements at that time. When money became available, and we started to work out the details, he told us that he would want more accommodation than had been provided. It is quite possible that at the end of eighteen months or two years his demands will be even greater, and we have provided in these plans for the addition of further accommodation when required. I cannot discuss the original plan because the Commission had nothing to do with the development of it; it was the result of consultation between Dr. MacKenzie and the Department of Works and Railways. The designing and construction of the building have now become the concern of the Commission, and we are putting forward a plan which we believe is adequate for present requirements, and makes reasonable provision for the future. The proposed building may be regarded as a separate architectural entity; it will be so far removed from any university buildings likely to be erected in the next 50 years that it will not compromise them in any way. The site is not in the university area, but adjoins it. The Committee of Public Taste has considered this matter, and, knowing the area set aside for university development, has satisfied itself that this building will not clash with the university group. For very many years the Canberra University will have only very limited activities in connexion with ordinary teaching. Its main feature will be the post-graduate courses, and the scientific part of the university will develop as close as possible to the buildings of the Council for Industrial and Scientific Research, and building will gradually extend southward to the top of University avenue. But there will probably be little development in the University area in the vicinity of the School of Anatomy inside the next 50 years. I think the Committee of Public Taste understands that aspect of the matter, but if any of its members are uncertain about it, I would welcome a further discussion with them.

21. *To Mr. Seabrook.*—At the consultation with Sir Neville Howse, I roughly estimated that the revised plan for the buildings alone would cost an additional £10,000. That estimate did not take into account the original under-estimate of the electric lighting, water supply, and sewerage services, and the non-provision of fire protection appliances, a petrol gas plant, and a central heating system. The building extensions are actually estimated to cost an extra £9,118; the other accessories, and the £2,000 allowed for contingencies, make up the balance of the increase of £20,000. The total of £85,000 is for the completed building in accordance with the plans now before the committee. This is the first set of finished plans prepared for this structure, although several sketch plans have been prepared and submitted to the Committee of Public Taste. The statement that the preparation of plans and specifications and other overhead costs preceding

the commencement of construction will represent 12 per cent. of the total, is utter unmitigated rubbish. Mr. Morris, the designing architect, will not be responsible for the business arrangements and the supervision of construction; the executive architect of the Commission deals with the practical side of the business. Rather than employ a private architect to prepare plans and specifications at a fee of 6 per cent., the cheaper, and, indeed, only practicable arrangement is that which we have adopted. We cannot contemplate the employment of private architects for the carrying out of all of these works. In connexion with any of the big public buildings, such as Parliament House or the administrative building, a tremendous amount of work has to be done before the private architects can be called in; then a public competition for the selection of a design would be necessary, and that would involve delay and expense. I am inclined to agree with the general proposal that we should make as many as possible of the larger works available to private architects by competition, but I am definitely of opinion that it is preferable for the Commission to supervise the actual construction. The Commission stated clearly that it could not handle this School of Anatomy when it was originally brought before the committee, because of pressure of more urgent works. Apparently through insufficient consultation between the architects and the requisitioning authority, an inadequate plan was put before this committee and adopted. The Commission has had enough experience to know that buildings cannot be proceeded with without the most careful preliminary investigation. We have had full consultation with Dr. MacKenzie. His requirements were stated on paper, and were then considered by us in detail, but before we incurred any heavy architectural expenditure we obtained his signed affirmation that he would be satisfied with the accommodation that he had asked us to provide. Buildings intended for scientific purposes cannot be designed and built haphazardly; only the people who are to use them know what their real requirements will be. When we are building for scientists we must provide what they want. Before tenders are called we shall discuss the architectural details of the building with the Committee of Public Taste. I do not approve of the suggestion that parapet walls should be provided above the courtyard, and a flat roof provided. I am of the opinion that £1,500 could be spent to better advantage elsewhere. The courtyard will be enclosed, and the design of the walls will not compromise the general architectural effect of the building. The Commission has to take the ultimate responsibility for any building it erects, and whilst we seek their advice, we are not under any obligation to act on it. If we disagree from the views of that body on any major matter, we let the Government know. Dr. MacKenzie wants the maximum amount of floor space in the museum, and that is why the stanchions or pillars have been eliminated, the whole roof being laid on 53-foot trusses. An estimate of 4 inches of expansion and contraction in those trusses is absurd. In any case, before the roof is built the plans will be thoroughly detailed, and we have officers quite competent to assure us of a thoroughly dependable construction. The Commission is responsible for the development of all governmental works at Canberra. The services of the Works and Railways Department are utilized, when convenient to it and to us, but there is no duplication of effort. In this instance, the department prepared the first scheme because the Commission was too busy to

undertake it. The intention of the Commission is to call for tenders for the construction of the building.

22. *To Senator Reid.*—The estimate of £85,000 is for the museum building, and does not include the reservation and residences.

23. *To Mr. Seabrook.*—The Committee of Public Taste emphatically prefers Gosford or Hawkesbury River sandstone to synthetic stone. The Commission having no preference one way or the other, will be guided by the architects in that matter. All that part of the building which will be the exterior facades in the final building will be faced with stone; the walls enclosing the courtyard will be of brick, treated with cement, and coloured to match the stone. The ultimate extension at the rear will be treated similarly to the main building.

The witness withdrew.

Walter Haywood Morris, Designing Architect, Federal Capital Commission, sworn and examined.

24. *To Senator Reid.*—I commenced my professional training in Sydney about 1915, and gained a diploma at the Sydney Technical College in 1922 and the travelling scholarship awarded by the Board of Architects for the year 1924. After spending nearly three years abroad, I returned to Australia towards the end of 1926, and was with the firm of Robertson and Marks of Sydney until my appointment with the Federal Capital Commission in November of last year. I am responsible for the plans for the proposed Institute of Anatomy. Towards the end of last year I interviewed Dr. MacKenzie in Melbourne and discussed with him the probable layout of the building based on the original scheme submitted to this committee. Dr. MacKenzie said that the plan would require some amendment, principally in a slight re-arrangement of the rooms and the provision of additional rooms. Amongst the alterations for which he asked were the provision of a small safe room in the basement for the storage of valuable articles, a small recess for the attendant near the entrance, and a small stall for the sale of literature, a waiting room adjoining the Director's room, a cinema-projection box for the lecture room, a dark room for photography, and other minor alterations. He also asked that the gallery to the museum which was originally shown as 12 feet should be reduced to 5 feet. Dr. MacKenzie said that the public would be confined to the ground floor and the galleries would be used only by the staff and visiting scientists; a reduction of its width would enable the supports to be eliminated and thus give more clear space on the ground floor. In April, Dr. MacKenzie visited Canberra and further alterations to the plans were made; they were the provision of a gallery in the library, a workshop in the basement, and a small elevator from the basement to the first floor. On the basis of these amended details, sketch plans were prepared in which I provided for a central entrance instead of the two small entrances shown on the original plan. The central entrance is much to be preferred in a small building, and obviates the need for double control of the doors. Moreover, the space is more economically utilized and makes for a more pretentious and presentable entrance hall. The only other big important improvement effected was in the disposition of the museum blocks. Instead of putting the museum at the back of the administrative block, Dr. MacKenzie agreed to the placing of two slightly smaller museums at each side, allowing for further extension across the fourth side, thus enclosing a courtyard 58 feet square, which could be treated as an internal court or garden. The inclusion of such a feature has innumerable advantages. Its treatment can be varied but it can always be made very beautiful. The quadrangle is a university

is always very much appreciated by professors and students. It is a sheltered spot and provides privacy for reading and study as desired. In this building it will form a break between the two museums. Visitors to museums often get what is known as museum fog, and if after viewing one section they can pass through an attractive courtyard or garden, the mind is refreshed and is better fitted for concentration on the remainder of the collection. This division also will help Dr. MacKenzie in the classification of his specimens. So far as the main elevation is concerned, I had to endeavour to express in the design an institute and museum. The laboratories were confined to the front because the southern light was required; thus we have confined all the windows to a certain area framed at each end with a blank wall. Since the original design was approved, Dr. MacKenzie has increased his collection and has received donations of various specimens. This has necessitated the provision of additional museum space. He told me that he will be able to utilize all the space provided and is confident that when the museum is definitely established, donations from other quarters will considerably increase his collection. He agreed to the alterations I suggested in the laboratories. We slightly re-arranged some of the rooms in order to fit them into a simple outline. These alterations were mainly in the lecture-room and library. In the original plan the lecture-room was in the centre. It has now been placed at the end of the building and the laboratories and library have been concentrated at the other end. One advantage of this is that the public is going to and from the lecture-room will not pass near any of the workrooms. The lecture-room will be naturally ventilated by ducts through the roof. Dr. MacKenzie said that he did not want natural light, because on most occasions the lectures will be illustrated by the cinema. If we put in windows we would have to provide effective means of blocking out the light. Moreover, it suited the plan best to have blank walls for both the lecture-room and library. The latter will be lighted from the top, as Dr. MacKenzie requested the elimination of all wall windows in order to provide a maximum wall space. The estimate for the stone facing is based on quotations obtained from the Hawkesbury River sandstone quarries for the supply and laying of the stone. Granite is not quite suitable for this type of building, inasmuch as its texture is coarse and the large particles are in contrasting colours. Sandstone has greater aesthetic possibilities for this design. It has a fine grain and can be more easily worked. We shall choose the warm, light-grey colour in preference to the yellow sandstone, and I think the lighter effect which it will give will be more suited to Canberra than would a granite facing. I cannot say off-hand what would be the cost of granite, but I am sure that the sandstone would be cheaper. In regard to the lighting of the museum, we had to aim at providing a good light on the show-cases on the walls. For this reason, I have planned top-lights in two long runs near the side walls the full length of the museum blocks. Thus there should be good lighting both in the centre of the building and along the side walls. With a centre top-light, the galleries would throw shadows. Side windows of adequate size were impossible unless they were placed above the show-cases, and that would increase the height of the parapet. A 52-foot throw of the light has to be provided for, and it would require a fair area of side windows in order to get a sufficient intensity of light. Under heating will be prevented by having a plain glass outer and an inner-glass ceiling, the latter treated in a more or less decorative way. The air space between the two tiers of glass will act as an insulation. The entrance hall and library will be similarly treated. To allow for any expansion of the

steel trusses through heat, we have provided for one end to be free and to be fitted to a roller. The roof between the trusses will be of wooden construction, with joists and flooring boards, the whole covered with sheet copper. The wood will insulate the girders against undue heating, and the air space between the ceiling and the roof will provide additional insulation. Piers or columns for the support of the roof in the museum would interfere with the position of the show-cases. Dr. MacKenzie wanted the floor space to be as free as possible. I do not think it would be worth an extra £1,500 to substitute concrete columns and arches, parapet wall and flat roof to the colonnade around the courtyard. Wooden construction was not chosen merely on account of cheapness. Wood can be treated in a decorative way, and the red tiles contrasting with the light walls and green foliage will improve the appearance of the courtyard. The upkeep of the wood need not be heavy. Hardwood stained and allowed to weather naturally will give as good an effect as painted woodwork. We are providing six points for fire services, and are considering also the provision of fireproof doors between the museum and laboratory blocks so that in the event of an outbreak, the building may be divided into three sections. The water supply and sewerage services have been taken into consideration. As a protection against fire, we have adopted the Innes Bell concrete flooring, which will give an even ceiling finish. In most cases the floor will be covered with wood. This construction will allow of the elimination of the supports in the basement, and thus increase the storage space. Concrete gives a good insulating floor and enables the height of the space to be reduced, therefore any extra expense involved is well justified. Most scientific laboratories require to use the Bunsen burner, and as coal gas is not obtainable in Canberra, we propose to install a petrol-gas service at a cost of approximately £200. The cost of the building has been estimated by quantities. The whole building, excluding the colonnade, works out on a cubic basis at 2s. 4.5d. per cubic foot. I think that the building can be constructed for that price. The Commission has not considered the provision of dwellings for the director and his staff.

25. To Mr. Seabrook.—Dr. MacKenzie has stated that most of the lectures will be illustrated by the cinema; therefore if windows were inserted we should have to provide shutters as well as blinds, but the arrangement of the lecture-room is such that the inclusion of windows would not be convenient. For the length of time that the lecture-room would be used each day, I do not think the cost of electric lighting will be excessive. I shall endeavour to let the committee know approximately the cost incurred in preparing alternative plans and tracings for this building. I hardly think it possible that the complete cost of preparation of drawings and supervision of construction would represent 12 per cent. of the total, but I think it would probably amount to 8 per cent. We in Canberra are unfortunately situated in that regard in that in many cases we have to visit Sydney and Melbourne to consult our clients and to get information from different firms. That adds to the cost. I do not know whether a private architect working in Canberra under the same conditions would be content with the usual commission rate of 6 per cent. Variations between the figures supplied by the Works and Railways Department for the original plan, and by the Federal Capital Commission for the plan now before the committee, are mainly explained by the increased area provided in the new proposal. For instance, the museum area is increased from 6,138 to 8,914 square feet. The boiler-room has been reduced, because it was found that the space provided originally is not required. On the other hand we have had to make provision in the basement for an electric sub-station. Differences in

the figures relating to area are explained by the fact that 38,331 represents the net floor area, inside the walls, whilst the other total of 44,439 represents the outside dimensions including the walls.

26. To Mr. Cook.—The increased area and the additional service is necessary, over and above what were allowed for in the original scheme, account for the increase in the total cost by £20,000. The additional services amount to about £9,000, so that the actual increased cost over the original estimate is only £11,000. I do not think that the accommodation required by Dr. MacKenzie could be provided more cheaply than we have estimated. The materials selected are the cheapest we can get for the quality of building that is required. The structure will be a permanent and important one, and it is essential that worthy materials be employed in it.

(Taken at Canberra.)

WEDNESDAY, 12TH SEPTEMBER, 1928.

(SECTIONAL COMMITTEE.)

Present:

Senator Reid, in the Chair;

Mr. Cook | Mr. Seabrook.
Mr. McGrath

John Smith Murdoch, Director General of Works and Chief Architect, Works and Railways Department, sworn and examined.

27. To Senator Reid.—I had an opportunity this morning to examine the plans of the amended design for the proposed Institute of Anatomy at Canberra. Sir John Butters, the Chairman of the Federal Capital Commission, advised me some time ago of the Commission's intentions and sent the Commission's architect to Melbourne to consult with me concerning the proposed alterations. I then expressed the opinion that so long as Dr. MacKenzie's needs would be met, the amended scheme would be satisfactory. I did not see the completed drawings until this morning. I take the view that since Dr. MacKenzie will be the man who will use the building for his collection, his opinion as to the required accommodation should be accepted. If the amended plan suits his purposes better than the original design, I think that he should get what he wants. Apparently he has altered his views as to the necessary accommodation since the original was made. Architecturally the new design is sound. I understand that Dr. MacKenzie is continually adding to his collection of specimens, and if he wants the extra accommodation provided in the amended plan the Government should seriously consider the question of providing him with it. The amended plan makes provision for two museums, one on each side of the quadrangle and for an extension, should that be necessary, on a third side of the quadrangle. I would not say that the plan now before the committee is more suitable than the original design. I consider both schemes satisfactory from an architectural point of view. The provision of two museums, one on each side of a courtyard, is in keeping with the spirit dominating the architectural work in Canberra. The usual plan observed in museum architecture is for one gallery to open off the other. I agree that the use of timber supports for the verandah or sheltered way between the two museums is not quite in keeping with the monumental character of public buildings. I admit that the proposal to use instead, concrete or stone in the form of an arched verandah would add materially to the cost of the building. In my view £1,500 would be a conservative estimate for

this work. After all, these things are largely a matter of individual taste and one cannot safely dogmatize on the subject. One man prefers one thing and another man something else. I should prefer an arched verandah in concrete or stone or whatever material is to be used for the facing of the building. There need be no difficulty about spanning the museum 52 feet wide with steel trusses without supports from the floor. In the original plan the galleries were to be 15 feet wide, but Dr. MacKenzie appears now to hold the view that galleries 6 feet wide all round the building would be more suitable, and therefore it is not necessary to support the steel trusses from the floor. Galleries 6 feet wide can be cantilevered from the walls, and the absence of supports will enable Dr. MacKenzie to display his museum exhibits to better advantage. The Works Department frequently adopts roof trusses with a greater span than 52 feet without the use of supports. The risk due to expansion by heat is negligible. I should say that the greatest heat we are ever likely to experience in Canberra will not cause an expansion in the steel trusses for the museum of more than $\frac{1}{8}$ (five-eighths) of an inch. I do not agree with the evidence of a previous witness who declared that in Sydney there is an expansion of 4 inches in steel trusses of 30 feet and 40 feet. I should say that that statement is an exaggeration. We use roof trusses 60 per cent. in excess of the span proposed for this museum, and our experience is that we can afford to ignore the risk of expansion from heat. No structure is absolutely rigid. It moves slightly in sympathy with any movement of steel trusses and without any apparent detriment to the building itself. I agree that roof lighting will make the building rather hot, especially in the summer, but it is the practice to light museums from the roof and as I understand there will be two layers of glass, one on the external roof plane and one on the ceiling plane, it should be possible to temper the light and considerably diminish the glare. The only alternative is to introduce light from the side walls. The only way to preserve exhibits from any ill effects of sunlight is to be careful in the selection of the glazing. I do not favour the use of blinds. The extra cost of the amended building which is estimated at £25,000 as against £60,000 for the original plan is, I should say, largely accounted for in the additional accommodation provided. If Dr. MacKenzie says that he must have a certain area of floor space, and if that area is an enlargement of the previous estimate, the cost of the building must go up; but to what extent should be a matter for close investigation. When the original plan was made and submitted to the committee the Government intimated that it desired to keep the cost down to the lowest possible limit. In fact the Minister for Works and Railways expressed alarm when he was informed of the probable cost. Consequently the department under his direction, kept the cost as low as possible consistent with the importance of the Institute. I admit that £25,000, regarded as extra expenditure for this building, is a large sum of money; but having in view the accommodation provided, I cannot see how it is possible to introduce much more economy into the design unless it be in the selection of the materials to be used in construction. I understand that it is proposed to face the building with Gosford or Hawkesbury stone. When I was consulted about the scheme the idea then was to face the building with synthetic stone. Our estimates showed that the original building, designed by this department, rendered in cement, would cost £29,800, and if faced with artificial stone £57,500 as against £29,800 if faced with Sydney freestone, so that according to the departmental view there was a difference of £12,000 in favour of synthetic

stone. This estimate appears to be at variance with the opinions expressed by architects consulted by the Federal Capital Commission. I prefer natural stone if it is cheaper than artificial stone, although I have often said on previous occasions that I would welcome the avoidance of using natural stone, because it shows signs of decay within a comparatively short space of time, thus necessitating considerable expenditure in replacement. Even in the short time that I have been engaged in the erection of buildings there has been evidence of decay in natural stone used. Chemically prepared stone can doubtless be made to resist decay for a greater length of time than natural stone, the composition of which is in the hands of nature and therefore beyond our control. If the building is to be faced with freestone I should prefer a stone nearest in colour to white, so as to conform to other public buildings in the Capital City. The design of the proposed institute, being sound architecturally, will harmonize with any buildings likely to be erected for the future university. The heating of the museum was contemplated in the departmental scheme. We intended to heat the offices and library, but not the other portions of the building. The Museum in Melbourne, which houses the same class of exhibits as will be accommodated in Canberra, is not heated and I fail to see the need for expenditure on the plant now contemplated. Economy might be exercised in regard to that item.

28. *To Mr. Seabrook.*—The original plan was drawn by the officers in my department in consultation with Dr. MacKenzie, both as to the area required and the class of building to be erected. That plan made provision for extension in the future. If Dr. MacKenzie now says that he requires additional accommodation, obviously he has changed his mind. He expressed himself as satisfied with the original plan. The committee considered the scheme which was amended as the result of suggestions made, not to provide more space but to make the building somewhat higher. This was done in consultation with Dr. MacKenzie, who declared that he was satisfied with what was to be provided. As I understand the position, the Federal Capital Commission took charge of the work and proceeded on different lines, arranging for the design of the building to give more accommodation. I presume that this action by the Commission was taken after still further consultation with Dr. MacKenzie, who, as I have said, may have altered his views as to his requirements. I think that possibly money could have been saved if, instead of drawing new plans, the original scheme had been altered to provide for a central entrance and an enlargement of the T portion of the building. But this again is a matter of individual opinion. I have judged many architectural competitions and my experience is that there is an infinite variety of ways in which a desired result may be obtained. It is therefore impossible to say definitely that in regard to architectural work it would have been better to proceed along certain lines. It is purely a matter of individual taste. All I can say is that Dr. MacKenzie knows what he intends to put into the building and he must take the responsibility of saying what floor space he wants now, also what accommodation he is likely to require in the future. The original plan did make provision for extensions, and the estimated cost was £60,000, or £25,000 below the estimate for the amended scheme, which gives, roughly, about 8,000 cubic feet more floor space. If the original scheme is not suitable for Dr. MacKenzie, then the expenditure in the preparation of that plan is wasted. The Federal Capital Commission, I think, is not in a position to prepare plans at a cost less than the expenditure in my department. I understand that the statement has been made to the

committee that the cost incurred in the preparation of the original and amended plans together with the fees paid to the Committee of Public Taste, represents about 12 per cent. of the total cost of the building. That statement is absurd. I should say that the total cost of all drawings and estimates to date would not reach £1,000. If the matter is worth while investigating, I can furnish the committee with a reliable return showing the cost to my department. I do not think it would amount to more than £350, and assuming that the Federal Capital Commission spent £900 or £700 on the same work, it would still be under £1,000, and might represent 1 per cent. of the total cost. I think it is probable that what the witness meant was that the total cost of preparing the original and amended plans, plus expenditure on account of the Committee of Public Taste, added to the usual architectural fees, might amount to 12 per cent. of the total cost. As to the position of the Federal Capital Commission, I can only say that as matters stand the Commission, being the body authorized by the Government to control building activities in Canberra, has to find the money and, no doubt, takes the view that its obligation is to see that such money is expended in a way in which it thinks best. A private architect is entitled to charge 6 per cent., plus travelling allowances and extras for the drawing of plans and supervision of building. I doubt if anything would have been saved if an outside architect had been called in to prepare plans for the proposed institute. The amended plan is quite in keeping with other public buildings in Canberra. The design, although rather original, is classic. It is the product of a scholarly person and, therefore, I cannot imagine it clashing with any future buildings that may be erected which, no doubt, will be similarly scholarly in expression. The design embraces features that are a departure from the traditional lines of architecture. This is what all architects are striving for. Their aim is to design a building that will meet the requirements and yet embody all the refinements on architecture that have been attained during centuries of progress. Still, to be fair to the architects of my department, I would say the same of the original plan. I do not agree that it is in any way inferior to the amended scheme, because it also is of a high standard of architecture.

29. *To Mr. McGrath.*—My department had nothing to do with the drawing of the amended plans. I assume that since the Federal Capital Commission is responsible for the carrying out of this work, it considered that it should have a voice in the design of the building. Plans for the original design were drawn by officers of my department under instructions from the Minister for Home and Territories. We were advised that the Government had accepted Dr. MacKenzie's gift on the understanding that suitable accommodation was provided for the specimens, and we were instructed to prepare the plans after consultation with Dr. MacKenzie. All this happened subsequent to the appointment of the Federal Capital Commission. I understood at the time that the Government intended to provide the money for the museum apart altogether from funds made available to the Federal Capital Commission for its particular work, and I presume that when the Federal Capital Commission learned that it had to provide the money as well as be responsible for the building, it considered that any building to be erected should be in accordance with the Commission's views on the subject. In the circumstances, no doubt, the Federal Capital Commission held that it was within its rights in exercising some oversight of the plan. Prior to the appointment of the Commission, plans for the erection of all the public buildings in Canberra were prepared in the office of the Works and Railways Department.

We are now doing all the work for the Commonwealth Bank under a special arrangement. I cannot say how much the Bank authorities are saving by this arrangement, but we have already done a great deal of work for the bank, and as far as I can see we shall be busily employed on bank work for the next five or six years. Under this arrangement my department is obtaining a considerable amount of revenue from the bank. We are getting 6 per cent. on the cost of all buildings, and for that fee we undertake to perform services which, if a private architect had to do the work, would be charged in addition to his ordinary fee. For example, we do all inspections and surveys. A great deal of the bank's work consists of repairs and additions to buildings, for which a private architect charges 10 per cent., whereas we do the whole of the work for a flat rate of 6 per cent. I imagine, judging from our business relations with the bank authorities, that they are well satisfied with the arrangement. If the Government had not appointed the Federal Capital Commission, my department would still have been doing all the architectural work for buildings in Canberra, excepting those which might be given to private architects.

30. *To Mr. Cook.*—The officers of my department and the architects employed by the Federal Capital Commission are really all employees of the Commonwealth Government. The money for their salaries comes out of the taxpayers' pockets. In my opinion, Dr. MacKenzie is the only man who can speak with authority concerning the accommodation that should be provided in the proposed institute. I admit that it does seem strange that within the short space of twelve months he should have so revised his estimates of probable requirements as to involve an expenditure of an additional £25,000 for the building. I say this, of course, on the assumption that the proposal for alterations has come from him. I do not know what has occurred in the interim. At the time he consulted me he expressed himself as satisfied with the accommodation proposed to be provided. We all admit that he has made a wonderful gift to the Commonwealth. It is, therefore, the duty of the Commission to provide sufficient space, but not more than sufficient, to meet Dr. MacKenzie's requirements. I do not regard the site of the proposed institute as the most important building in the University group will be the great University Hall, where ceremonial assemblies will be held in connexion with the conduct of the University. The institute will be erected on a site a considerable distance from the University, and therefore it may not be regarded as an immediate member of the University group of buildings. Economy might be exercised in regard to expenditure on heating. Except for the staff and library portions of the building, heating should probably not be necessary. I cannot suggest economies in connexion with the amended plan except, perhaps, in the direction of saving money on the heating and in the nature of the materials to be employed in construction. The original plan provided for future extensions of the building if that should be considered necessary. It is the obvious duty of every one to see that public money is spent to the best advantage. I say, therefore, that the plan should provide the accommodation required by Dr. MacKenzie, but no more, and also allow of suitable extensions in the future. I note that £2,000 is set down in the estimate for a lift. That amount is not at all extravagant, because lifts cost a lot of money. I understand that a lift is necessary for the removal of exhibits from one floor to the other. If a building of the size shown in the design is required for the purposes of the institute, I see no particular extravagance about the design.

31. *To Mr. McGrath.*—The original proposal was sound, and if the committee recommended the Government to adhere to it, I should offer no objection. As I have stated, Dr. MacKenzie advised that it met all his requirements. The Federal Capital Commission has been handling the matter, and I cannot say to what extent his views as to his requirements have changed. I have great sympathy with him, and I can understand his anxiety to get his exhibits into a suitable building as soon as possible. He has been long suffering. On the other hand, it is important that we should spend no more money than is necessary on a building to house his gifts suitably.

32. *To Mr. Seabrook.*—If the original plan were adhered to it would be possible to provide for any necessary extensions of the building.

(Taken at Sydney.)

MONDAY, 26TH FEBRUARY, 1929.

Present:

Mr. M. CAMERON, Chairman;	
Senator Payne	Mr. Gregory
Senator Reid	Mr. Jackson
Mr. Coleman	Mr. McGrath.
Mr. J. Francis	

Bertrand James Waterhouse, Architect, sworn and examined.

33. *To the Chairman.*—I am Deputy Chairman of the Committee of Civic Design, formerly known as the Canberra Committee of Public Taste. Its functions are to review plans being prepared for the Government, and to advise on constructional and aesthetic matters. The committee has had under review a proposal for the erection of an Institute of Anatomy at Canberra. Preliminary plans were first submitted to us, and amended plans were placed before us at a later date. Various suggestions and alterations were put forward by the committee, particularly with regard to the shape and design of the museum, the idea being to provide for the more economical extension of the building at a future date. Attention was given to the suitability of the site, but the amount of accommodation required, and the general lay-out of the building, particularly in regard to the juxtaposition of certain rooms and laboratories, was regarded as detail work which could be left entirely in the hands of the architect at Canberra. The architect conferred with Dr. MacKenzie to ascertain his exact requirements, and from the information obtained he drew up the plan. In our criticism of the plan the members of the committee kept in mind the fact that it was necessary to adhere to a particular design as suitable for the scientific purposes of the building. In the original sketch provision was made for one central museum. That appeared to the committee not to allow for future extension, and we suggested that a divided museum would be preferable. After consultation between Mr. Morris and Dr. MacKenzie, this suggestion was agreed to. In the revised plans the main administrative and laboratory block is the same as before, but the museum is now in two separate parts forming a quadrangle, so that future extensions may be carried out in two directions. When the plans were still in pencil we again had an opportunity of seeing them, and after a discussion we agreed that they were quite the best that had been submitted. We gave special consideration to the lighting of the cloisters, and certain suggestions made by the committee have been adopted. These plans provide for an open central quadrangle with a covered way around it so that people may go from one museum to the other under cover. I have

been deputed by my committee to express the opinions and conclusions of that body regarding these plans. It was felt that, as the Deputy-Chairman of the committee, and the one who was generally in charge of its discussions, except when Sir John Butters was present, I was qualified to express the conclusions of members. However, any other member of the committee would, I am sure, be only too pleased to give evidence before this committee if required. The members of our committee appreciate the fact that we were allowed to study the plans before they were fully developed. It is generally a little late to ask for advice on plans after the working drawings have been prepared. Such alterations as the committee suggested had to do mostly with the re-arrangement of positions, leaving the accommodation practically the same. The front block also has retained its original character. My committee is unanimous that the plans now before the Public Works Committee provide for a building which will be eminently suitable for the purposes for which it was designed. We consulted regarding the inter-relationship of rooms, and we were assured by Mr. Morris that the detailed work, such as the position of the museum and the laboratories, was such as to be most convenient for carrying out the necessary work. The committee did not give consideration to any plans prepared by the Department of Works and Railways in 1927. At first three designs were prepared and submitted to us. The original plans for this building were, I remember, on the table at a previous meeting of this committee when I was giving evidence, but they were not submitted to us, and I cannot say in what respect they fell short of the requirements. I was given to understand that the plans which we considered later had been developed from those tentative designs. The building as now suggested will provide more accommodation than previously, due to the extension of the museum; but it will not be more ornate. In regard to decoration the design has not been altered at all, but merely worked out more in detail. We gave consideration to the manner of roofing the museum, and the lighting of the cloisters and museum was discussed. I think the original estimate for this work was approximately 270,000. The last estimate submitted to us, after the adoption of our suggestion, was roughly 230,000. The committee was not asked to prepare any estimate of the cost of the building; we were simply informed that certain requirements were to be met, and that the departmental estimate was so much. In none of these investigations are we asked to verify the estimates, but for our own information we find out how much per square or cube the architects are allowing, and we are then in a position to say whether or not that is reasonable. The idea was that as the quadrangle area would be completely enclosed when the building was extended, everything showing inside the court should be treated in cement. The whole building would be built of brick and cement, but the external walls would be covered with stone. At the last moment consideration was given to the use of synthetic stone; but that aspect of the matter has been dealt with in evidence previously given before this committee. We suggest a stone veneer 9 inches in some places and 4½ inches in others. I agree that there should be embodied in the building certain panels of cut stone. Economy has been exercised in every direction, particularly in the simplification of the elevation. A few panels would relieve it from the monotony of a plain facade, and it would not add to the cost to any extent. If economy were a main consideration, the panels could be left in an unfinished condition and carved as some future time. Three large panels are proposed, and £500 each would be more than adequate for them. The small panels would not cost more than £30 or £40 each. From an aesthetic point of view it is necessary to punctuate the

facade by means of some system of decoration; otherwise the building will not possess the necessary character. In this case such work may be carried out at very small additional cost. The building certainly calls for some decoration, because such strict economy has been exercised everywhere else. There are no heavy mouldings or projections. The cornices are slight, and there are no ornaments except in these points of punctuation. I should not recommend that these ornaments be done in terra cotta. The disadvantage of a large area of carving in terra cotta on a stone building is largely one of conflict between the textures of the materials. It is almost an axiom with good architects that where possible the materials used in a building should be as few as possible. A material like terra cotta, differing in texture from stone, should not be used on a stone building if it is possible to avoid it. Stone buildings should have the decorations carried out in stone. If the building were of terra cotta, then the decorations might be of the same material. As for the flooring of the building, I am of opinion that any hardwood of the same density as tallowwood would do quite as well as that material. It has become almost a convention, however, to specify tallowwood for this work. Possibly it was thought that there might be a good deal of traffic over these floors, and much moving of heavy cases. Jarrah is an excellent timber, but it is not so good as tallowwood.

24. *To Mr. Jackson.*—One of the difficulties which I have found as a practical architect in the use of Tasmanian hardwood such as stringy bark is to secure any guarantee that the timber is seasoned. Firms will undertake to supply seasoned jarrah and tallowwood, but it is difficult to be sure of obtaining seasoned wood in the other classes of timber.

25. *To Senator Payne.*—I have had experience in the use of Tasmanian myrtles for flooring, but it is not so dense as tallowwood. I have used it in houses, but have experienced some trouble due to shrinkage.

26. *To the Chairman.*—The committee carefully considered the ventilation of this building. It may be seen from the drawings that the upper part of the hall is top-lighted, which is a more successful form of lighting than large external windows. The committee felt that this system of lighting would keep the place cool, and provide more light. With moveable lights the ventilation should be quite sufficient. There is no better form of ventilation than that which is situated near the ceiling. The warm air rises, and if there is means of escape for it at the top, the air in the room is kept pure, and people are spared that feeling of depression to which they are subject in an ill-ventilated room. I understand that the specifications provide for the mechanical heating of the building, but that matter did not come before the committee for consideration. An elevator will be necessary for handling material for the museum. The lift well is shown as being 7 ft. 6 in. by 5 ft.; but the elevator itself is only 6 feet by 4 feet. That is not too large as it may be necessary sometimes to use the lift for moving cases from one part of the building to another. The lift could be used either for passengers or for goods. Even in a two-story building an elevator would be a distinct help. By means of an elevator entry access would be provided from the basement to the ground floor of the museum, the first floor, and the gallery. In dealing with the lighting of the museum, the committee considered the most economical way of lighting a large span of 51 feet. Several schemes were submitted, and it was considered that the system of built-up beams would be the best. The flat roof is the most simple. In this case it will not have to carry any heavy loads. As to the water proofing of the roof, we are constantly faced with this problem in buildings in the city. Take, for example, a reinforced concrete roof subjected to

changing conditions. Anything we have ever put on in the form of natural asphalt has always cracked, and proved a most unsatisfactory covering. The ideal flat roof has not yet been devised. The best we have yet succeeded in getting is a well-laid malthoid or bituminous felt roofing, with a gravel surface, which prevents the volatilization of the oils in the malthoid or bitumen. It is important to have proper fall for a roof such as this. The roof, although described as flat, must not be actually flat, but have sufficient fall to allow the water to drain off. If we were manufacturing roofing material for flat roofs, I should have an instrument made indicating the necessary fall, and if that were not used by the contractor I should refuse to let him have my roofing material. There is no reason why a roof such as that specified in these plans should not last for ten years. I have had roofs laid down for ten years, and beyond coating them with bitumen every three years, no attention is required. This roof which we are considering should have a fall of 18 inches to 2 feet from the centre to the gutters. There are some buildings for which a flat roof is the most suitable that can be used. In this case, if we abandon the idea of a flat roof, we are driven back to a wooden structure supporting a covering of tiles. For this class of building such a roof would not be appropriate, because top lighting is desirable; also a flat roof is the most economical form that can be laid. These plans provide for a fall of 2 feet in 25 feet, which is ample. It is intended that the galleries round the museum shall be open to the public. These galleries are six feet wide, and the committee thought that this was wide enough to allow visitors to examine the show cases against the walls. The disadvantage of having wide galleries is that the wider they are the more light and air they cut off from the ground floor, which is the most important part of the museum. I think it would be better to have the door leading into the gallery 3 ft. 6 in. or 4 feet wide, rather than 3 feet as shown in the plan. Provision is made for a fireproof sliding door, and whenever that is done an attempt is made to reduce the aperture to a minimum. Nevertheless, I think it would be better to increase the doorway to the maximum width of the corridor. I have no information regarding the type of marble which it is to be used for paving the main entrance hall. Nothing was put before us regarding the internal finish of the building. I suggest that the colours for this paving might be black and white—black margin with white centre in squares of 18 in. by 18 in. I should not favour placing arches between the columns of the central loggia. The haunches of the arches cut off a great deal of light. The proposed plan is quite an artistic treatment. It is simple in design, and gives a maximum amount of lighting which is essential for the rooms at the back. Where the arch treatment is adopted a greater height than 12 feet is necessary. No opinion was asked from us regarding the covering of the building. That is a matter for the engineers. I consider that the provision for fire escapes is adequate. There are two means of exit from the loggia, and fireproof doors are provided. I presume that fire hydrants will also be installed. Externally, the staircase accommodation from the upper floor is adequate. I consider that the design of the building provides for the circulation of a reasonable number of visitors. That matter was discussed by the committee, and the alterations which we suggested, and which have been adopted, were based largely upon a consideration of that point. We believe that the concentration of museum work in one room was wrong. It was held that the museum accommodation should be divided, and the cloister would provide a ready means of access from one division to another. This would also prevent congestion.

27. *To Senator Reid.*—If we are building a timber roof we cover it with boards, and for the best classes of work we double board it. Then we put on three layers of bituminous felt laid in bitumen. We pay particular attention to the turn-up where the water is travelling parallel with the walls, in order to see that there are no right angle bonds in the material. We have found also that the life of the material has been prolonged when the surface has been gravelled. That type of floor does not expand and contract with variations of temperature nearly so much as concrete. There is more give and take in the timber, and the bituminous felt shows little signs of buckling. If any blisters appear, they can easily be cut out and repaired. Where there are large spans, beams are laid from girder to girder. In a warehouse, for instance, with a twelve feet span the beams carry across transversely from the ordinary joists. The necessary fall is then obtained by building up with timber. We have had no success with nonchast asphalt as a covering for flat roofs. It may be successful in a more temperate climate, but we have not found it so here. The lantern system of lighting will not be interfered with by the method of roofing here suggested. No difficulty should be experienced in making the lantern lights waterproof. To make any part of a building watertight or wind-proof is really a technical point of construction. It is a matter of good workmanship. I take it that if this work is done by contract there will be a clerk of works on the job, and a supervising architect, so there is no reason why the specifications should not be carried out to the letter. The general interior layout of the building has been devised in accordance with the requirements of Dr. MacKenzie, and only in minor matters have we suggested alterations. I understood from Mr. Morris that the pencil drawings of this building were submitted to and approved by Dr. MacKenzie. This course was insisted upon by our committee. The committee was not consulted as to the class of stone used for the building, except that it was informed that sandstone or freestone would be used. It is proposed to cover the front and two sides with stone. No decision was arrived at as to where the freestone should come from. As a result of my own experience I should favour the use of Hawkesbury stone. It is a very satisfactory material, and, as far as I know, can be delivered more economically at Canberra than can any other sandstone. So far as I know there are no suitable freestones to be obtained in the vicinity of Canberra. Granite is obtainable at Goulburn, but that is all. The committee was satisfied that the site was an admirable one for such an important building.

28. *To Mr. Gregory.*—The committee considered whether this building should be erected on the particular site chosen, or whether it might not be better to reserve the site for a more important building. We were assured, however, that this building, although not actually part of the university group, would be associated with the university in the work which would be done there. That being so, no exception can be taken to placing the building on this site. The quadrangle shown in the plans will be laid out with grass plots, gardens, and ornamental shrubs. The two museums will be identical in design. For a building of this kind, which will be remote from city traffic, no great harm could come from putting sandstone right down to the ground. If the stone is laid on its natural bed it will last a long time. It is true that in Sydney some of the sandstone weathers badly near the ground. Water runs down the side of the building, and heaves next the footpath, softening the stone, and flaking off the surface. It is possible now, however, to treat sandstone with material which will prolong its life. It is possible that heavy frosts might affect the stone near the ground. It would not detract in any way

from the appearance of the building to use a harder stone for the base, but it would add to the cost. Either granite or trachyte would cost much more than sandstone. Granite, I should say, would cost 6s. or 7s. a foot more. I should prefer granite to trachyte for this purpose, because granite would not need to be polished. Sand granite would do quite well.

39. *To Mr. Jackson.*—Several schemes were prepared for this building before our committee began to operate at all. The original estimate, as far as I know, was about £71,000, and the most recent estimate, after the suggested alterations had been adopted, was about £80,000. It is proposed to cover the front and the two sides with freestone. It is true that many Sydney buildings covered with freestone show considerable signs of weathering, but that, in most cases, is where heavy overhanging mouldings are used. In the simplest types of building it is amazing how long the stone will last. This particular type of building has been designed to avoid that weathering. The facade is quite simple, and there are very few projections. The surface is practically flat, with the exception of a few shallow cornices. The weathering has been serious on such buildings as Westminster Cathedral in London, because they are of a very ornate character, with heavy mouldings and carvings. Moreover, in Parliament House, London, the stone itself is of an inferior character, so that many thousands of pounds have been put in maintenance. This building, as designed, will hold itself to freestone treatment, and will be reasonably permanent.

40. *To Mr. McGrath.*—Even if it could be shown that granite was only one-third dearer than freestone, I should not recommend its use for this building. The setting in Canberra calls for something more cheery than granite. Owing to the difficulty of working granite it is almost impossible to do anything in the way of moulding or ornamentation without very great expense. A facade would have to be adopted of a design not suitable for Canberra. There would be no objection to the use of granite as a base for the building. An example of the permanence of freestone is provided in the Union Club in Sydney. Except in one or two places, the stone in that building is perfectly preserved. I have seen the old Anglican Church at Canberra, and the stone shows a good deal of weathering, but that is a conglomerate stone. The completed plans for this building were not prepared when I gave evidence previously before this committee. Our serious consideration was given to the preliminary pencil drawings when the design of the building was first being developed. We have had every opportunity of studying the work as it has gone on. These plans were submitted in a modified form at the last meeting of the committee. The present plans are contract working drawings, which, I take it, will be submitted for tendering. Practically all the information which a contractor would require for tendering is provided by these plans. If the specifications cover the ground as well as the drawings it should be possible to get very good tendering. These plans have been evolved under the personal direction of the Committee of Civic Design. I am quite satisfied that the fullest information has been placed before our committee, and I have been asked to place the views of members before the Public Works Committee.

41. *To Senator Payne.*—There was at first some indecision in the minds of the members of my committee as to what material should be used for facing this building. Members were undecided whether freestone should be used, but ultimately this material was chosen; the alternative under consideration was cement. We felt eventually, however, that the building was too important to be finished in cement. The alteration in the plan for facing the building would account for

some of the extra £10,000 cost. Extra museum space, and greater equipment, probably account for the rest. We thought the building should be constructed, as far as possible, of brick and cement, with reinforced concrete for columns and balcony. The roof was to be of malthoid, and the long beams over the museum should be of steel. We specified that the flooring should be of wood, but the kind of wood was not considered.

42. *To the Chairman.*—The structural work of this building should be just as good in 100 years' time as when it is erected. Repairs would be necessary to the roof from time to time, but the rest of the building should remain sound.

43. *To Mr. Coleman.*—I cannot say off-hand how much more it will cost to finish three sides of the building with freestone as compared with cement. That is a matter of quantities. Measurements would have to be taken to determine how much stone would be required.

44. *To Mr. Jackson.*—Normally it should cost about twice as much to finish a wall with freestone as with brick and cement. I consider that it would be false economy to refrain from giving this building a good finish in view of its importance, and the importance of the site which it will occupy.

45. *To Mr. Coleman.*—The committee was moved by purely aesthetic considerations in recommending that freestone should be used for covering the facade. Nevertheless, it must be remembered that the facade would need entirely different treatment if it were to be finished in brick and cement. In planning a building, an architect must decide first on the material which he proposes to use, and must then evolve his design to suit it. This building has been designed for a freestone finish. Probably there will be a difference of £3,000 or £4,000 in the cost of finishing the building with freestone, as compared with brick and cement.

(Taken at Sydney.)

TUESDAY, 26th FEBRUARY, 1920.

Present:

Mr. M. CAMERON, Chairman;

Senator Barnes	Mr. J. Francis
Senator Payne	Mr. Gregory
Senator Reid	Mr. Jackson
Mr. Coleman	Mr. McGrath.

George Herbert Godsell, Architect, Fellow of the Royal Institute of British Architects, Fellow of the Royal Victorian Institute of Architects, sworn and examined.

46. *To the Chairman.*—I was at one time Chairman of the Committee of Public Taste at Canberra, and in that capacity had before me some time ago plans for an Institute of Anatomy to be erected in that city. I made certain suggestions which I thought would improve the design. I had an opportunity of seeing the plans now before the committee. They embody, to a very large extent, the improvements suggested by me. I do not think that the proposed design of the museums is all that it might be. This building is to be constructed of stone and brick, with concrete floors, and some portion of the roof is also to be of concrete. I think it would be less costly and more satisfactory to construct the museum portion of the building of steel and concrete. I should have stanchions at every bay, and light, lattice trusses forming the roof. The stanchions would then carry the roof over the loggia, as well as the balcony round the interior of the museum. The 18-inch wall against the loggia could then be replaced by one of

9 inches. It would then be only a curtain wall, and would not be part of the structure itself. The interior subdividing walls of the structure generally should not be treated as constructional walls at all. The treatment which I suggest would not cost any more, and might cost less. The advantage would be that it would allow subsequent alterations in the interior arrangement of the building to be made at no great expense. I think it would be very unwise to construct the lantern lights above the museum in concrete. They could be far better and easier made of copper and would not then be liable to fracture as concrete will if carried upon other concrete work. Concrete upon concrete is not good, because the expansion and contraction may be such as to cause a breakage of glass. The concrete is likely to be affected by changes in atmospheric condition, but this would not apply to copper. The use of copper would provide a light structure, and there would be more room for light. The amount of expansion and contraction in such a building as this at Canberra would be fairly considerable. Especially would this be the case in the long span across the museums where there would be a variation of from 2 in. to 2½ in. in the solid steel beams as designed over the span of 50 feet. That is why I suggest that the whole of the museum should be framed with steel, together with light steel lattice trusses in which the expansion and contraction would be less. The plain roof may well be of concrete, but the lantern lights should be finished in copper. It seems to me absurd to use tons of material for a job where hundredweights will do. Concrete is a suitable material for certain types of work, but it was never meant for a job like this. By using copper it is not necessary to do any forming such as is needed for concrete, and in this way money is saved. The main roof, which is to be of concrete, should be covered with neuchatel asphalt. The concrete itself should be of the best material; sometimes poor ash concrete is used, and then the asphalt laid on top of that. When such a roof is subjected to heat, the whole thing begins to move. In the whole of Sydney, not one concrete roof which has been properly covered with neuchatel asphalt has leaked. As for the flooring, I admit that it is possible to get good Tasmanian hardwood, but for first-class flooring you cannot go wrong in using good tallowwood. The best floors I have ever laid down have been of jarrah. One thing in favour of jarrah is that no other timber can be mistaken for it. It is possible, even when tallowwood is specified, for some other sort of timber to be supplied instead. Jarrah must be polished to bring it up to a proper surface; but it will not absorb the polish, and it is necessary every now and then to clean the polish off. Otherwise there will accumulate a seum on the surface which looks objectionable. Nevertheless, a jarrah floor is one which well repays the trouble involved in cleaning. It may be that the designers thought there would be heavy trucks passing over this floor, and it might not be suitable to put down a highly polished jarrah floor. Personally I should not have thought twice about the matter; I should have specified jarrah. I do not think that sufficient means of access is provided to the galleries. If the public are to be admitted to the galleries 3 feet wide doorway does not seem to me to be sufficient. I should suggest that access be provided by means of a staircase, in addition to the entrance to the loggia. When we consider whether or not sufficient means of escape are provided in case of fire, we come again to the matter of access to the galleries. A doorway 3 feet wide would not be sufficient to allow visitors to the gallery to escape in case of emergency. The exits from the main building are sufficient, but this does not apply to the galleries of the museum. I suggest that Gosford sandstone should be used for

facing the building. Hawkesbury stone contains more vegetable matter than Gosford stone. David Jones' new building is faced with Hawkesbury stone; while Farmers' building is faced with Gosford stone. Anyone who studies the stone in these buildings carefully can see the difference between them. There is no doubt that Gosford stone, when first quarried, contains a great deal of quarry sap, and is soft; but when it is out of the quarry for a time it becomes hard and dry. It works very easily when first quarried, but afterwards becomes more difficult to work because it hardens. It is unnecessary to use granite for facing this building. I realise that this is designed as a permanent building, but granite would give it the appearance of being overladen. The effect would be too heavy. Granite is quite suitable for the base of a great building, but for a low structure such as this, could not satisfactorily be used for the whole building. The Bank of New South Wales in Sydney, for instance, is 150 feet high, and in a high building of that kind one can quite easily carry the granite base up to a height of 40 or 50 feet. The effect of the freestone springing from this granite base is then very fine. Granite would not be suitable for this building, and to use it would be rather like putting a refined lady into the clothes of a costermonger's wife. I have not given any consideration to the cost of this building.

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47. *To Mr. Gregory.*—It would not be necessary to use very heavy steel in the frame of this building. Taking the price of Canberra bricks into consideration, the type of construction which I suggest should cost very little more than that proposed in the plans. A 9-inch or 11-inch wall would be quite sufficient, just wide enough to fill out the width of the stanchions. The front portion of the main building could also be built with a steel frame. The partitions could then be put in with walls 1½ inches thick, so that they could be pulled down and altered very easily. That is the advantage of having the front and outside walls made of steel framing, and strong enough to carry all the weight. The 3-ft. doorway into the galleries is not adequate without some other means of access. It would be better to take something off one of the adjacent rooms, and make the door wider. For the lantern lights I should have steel angles, steel channels and steel foot and head plates, and then cover it with copper. The cost would not be much more than if the work were done in concrete. If I were laying jarrah floors, I should not have the boards more than 3 inches wide. In that 3 inches I should include the tongues and grooves. The floor boards should be 1½ inches thick with special tongues for secret milling. The best floors in Sydney are jarrah floors, and jarrah, I think, costs less than tallowwood. A fall of 1 inch in 10 feet would be necessary to secure proper drainage for a flat roof. The neuchatel asphalt, which I suggest as a covering for the roof, is made in Australia in accordance with patent rights held in England. An inch of neuchatel asphalt should be laid on the concrete roof. Neuchatel cannot be laid on wood, only on concrete. If it is thought desirable, in order to avoid possible weathering of the freestone around the base of the building, granite may be used there to a height of 4 ft. 6 in. The experience in Sydney has been that sandstone deteriorates more quickly at the base than the top if the base is kept wet. Stone deteriorates more from the method in which it is worked, and from the fact that it is subject to weathering. A good mason tools the stone, and never hits it. A bad mason punches the stone, and destroys its texture. So much of this work, however, is now done by machinery that the deterioration in stone is much less now than ever. I do not think that sandstone, even if used right down to the base of the building, would be very much affected by climatic conditions. It is necessary, however,

to keep it dry. If the ground is damp and muddy, moisture will get into the stone and do damage. All things considered, however, I should recommend the use of a 4 ft. 6 in. granite base, finished to a shot-faced surface. I have not heard of any scientific experiments having been carried out on Gosford or other stone with the idea of testing their durability.

I have seen Gosford and Hawkesbury stone worked in the same yard. In the Hawkesbury stone one may see the vegetable matter appearing in the form of small black spots like currants in a pudding; Gosford stone is quite clear. I admit that it is desirable that some uniform building material should be used in Canberra, and to that end it might be a good thing to have a scientific test made of the relative durability of different stones. I have myself experimented with Gosford stone, subjecting it to freezing and baking, and it stands up to the tests well. I did not myself go out to the Fairy Meadow Quarry at Canberra, but I was instrumental in having the head foreman for Dorman, Long & Company visit it. Relating his experiences to me afterwards he said: "I went to have a look at the stone with Colonel Owen. We stopped at one place, and I said to Colonel Owen that we had better go on and have a look at the quarry. He told me that we were at the quarry. I said that if that were so, it was quite evident there was no quarry there, and we might as well go back." The foreman informed me that the stone was nearly all of twisted grain, that it might do very well to break up and put on the road for metal, but it was of no use for anything else. It was simply a farce to think of getting stone from Fairy Meadow. In any case, it would be almost impossible to equip the quarry so as to work it economically. Part of the front of David Jones' new building in Sydney is faced with granite. Some of the best granite available in New South Wales, however, is to be had at Goulburn, which is quite close to Canberra. I often wonder why more of it is not used.

48. *To Mr. Coleman.*—My suggestion was that this building should be made with a framework of steel, covered with concrete, and finished in freestone.

49. *To Mr. Jackson.*—By lattice girders I mean steel sections laced together by short, light pieces of steel joining them transversely. These girders, which would rest on brackets attached to the steel stanchions, would take the weight of the roof. The term "shot-faced surface," as applied to granite, means that finish which is put on the stone just before the final polishing process is undertaken.

50. *To Mr. Francis.*—I am of the opinion that the alterations which I suggest could be effected without exceeding the estimate of the architects.

51. *To Mr. McGrath.*—This building will have to house some very valuable collections, and should, therefore, be made as safe from fire as possible. I think, however, that the design provides for a building which will be as near fireproof as we can well make it. I have not read the specifications and therefore do not know what they contain. I presume that provision is included in them for fire hydrants.

52. *To Senator Payne.*—I think it would cost less to have the building carried out with a steel frame if the whole building were treated in the same fashion. When I first put forward the suggestion that steel should be used I was thinking only of the museum, and looking at it from the point of view of the best means of construction. I was not then considering the matter from the point of view of cost. Dealing with the matter of cost, however, I think that much will be saved by not having to use bricks, which at Canberra are expensive in comparison with steel which may be bought cheaply at the present time. The use of steel would minimize the possibility of fracture

in any part of the building. That is one reason why I recommend it. The other is that it would enable interior alterations to be effected quickly and cheaply. I have had no personal experience in the use of Tasmanian gum, or red myrtle for flooring. I have heard of it, but have not myself used it. Tasmanian hardwood, if well seasoned, would probably stand the wear and tear on a floor of this kind as well as any other timber. There is no doubt that jarrah has been pushed on to the market, and that is probably why it has been more generally used than tallwood. It has always been seasoned, and little trouble has been experienced with it.

53. *To Senator Reid.*—Even though the Fairy Meadow quarry had not been opened up properly when the foreman of Dorman, Long & Company expressed his opinion of the stone, I still think that he was probably justified in speaking as he did. He saw some of the stone that had been taken up, and also had an opportunity of seeing the stone in the quarry. I myself have seen some of the best stone that the quarry can produce, and I should not give it five seconds consideration. The grain, instead of being straight, is twisted. I saw some of the stone after it had been dressed and polished. I have studied the ground on which this building is to be erected, and I do not think there is any likelihood of its becoming muddy or slushy. Therefore, a good freestone, even if used right down to the ground, would, I think, meet all the requirements of permanency. There is no absolute need for a granite base, but it would set the building off, and improve its appearance. The system of construction which I have recommended, namely, the use of steel framing, is the more modern method, and no man who knows his job these days ever builds continuous walls. The method is out of date. In a building of this kind, where fractures are to be avoided, and in which the internal walls should not carry the load, it is most desirable to use steel in its construction, thus making the floors independent of the sub-division. I do not believe that any building can be erected in Canberra or elsewhere in which it may be confidently said that no alterations in interior arrangements will ever be needed. Most buildings have to be altered within 15 years from the time they are put up. During the 25 years that I have been practising in Sydney I have never seen a building which has not been altered within ten or fifteen years of its erection. The probability that this building will be altered is even greater than with an ordinary city building. In the first place, I do not think that the architects of this building really know yet what is wanted, and it is practically certain that arrangements will have to be made later for something of which they have not now thought at all. That being so, it is better to adopt a type of construction which will permit of these alterations being made as easily and cheaply as possible. Apart from such considerations as this, there is no particular objection to the method of construction proposed in the plans; constructionally, there is nothing against it, except that it is not a modern method. I would not favour the use of a cantilever verandah in the place of the one shown in the plan; for the roof, I should put the concrete on top of the lattice girders, leaving joints to take up expansion. Over the concrete I should put the neutral asphalt. If the solid steel girders are used to support the ceiling, they must rest on a plate in such a way that there will be sufficient room left on the seating between the end of the girder and the wall to permit of expansion. In a steel lattice girder, however, there is not nearly the same expansion and contraction, because there is not the same thickness of material. Also, the open nature of its construction permits the air to circulate freely through it. I should not

recommend the use of a timber roof covered with felt. Even if the roof were built up of wood, it would still be necessary to lay the timber on steel over the 50 feet span. It is true that there would be little expansion, but felt roofs do not last. They have a life of only about ten years, and it would not be right to place such a roof on a monumental building of this kind. The lantern lights are made waterproof by fishing the sides and the copper eills over the asphalt, which is turned up under same. This will provide for the expansion of the other parts, and will, therefore, be always watertight. The covering of asphalt keeps the concrete so cool that the expansion and contraction is reduced to a minimum. It may be that if the number of visitors to the museum is small, a 3 feet wide doorway to the galleries would be sufficient, but I would prefer to see the doorway made wider. I regard this as practically a fireproof building, but if ever it did happen to get on fire, the students would have some trouble getting clear with the present means of escape. I have no brief either for jarrah or tallwood. I merely say that had I been drawing up the specifications for this building I should not have gone past jarrah. It would take nearly as much trouble to keep a tallwood floor in order as one of jarrah. I do not think that either Hawkesbury or Gosford stone would suffer any damage from contact with the footpaths in Canberra, or from the Canberra climate.

54. *To the Chairman.*—Both Gosford and Hawkesbury stone last well, and I should say that after they had been in place for 50 years they would look just the same as when the building was erected. Whether or not they will still be as good in 200 years depends on atmospheric conditions. If there are no acids in the air, the stone should last for a long time. The damage done by frosts depends a great deal on the kind of frosts experienced, and the manner in which the stone is exposed. I do not think that the frosts at Canberra are sufficiently severe to do much damage.

The witness withdraws.

Sidney Frank Marsh, Managing Director of Whitehurst's Uralia Granite Company Limited, sworn and examined.

55. *To the Chairman.*—I have seen the plan of this proposed building, and know the purpose for which it is to be erected. The building is one of national importance, and should be constructed of the most durable material obtainable. I observe that it is proposed to use freestone for facing the building. I presume this is to be hand-wrought freestone, as nothing else would do for such a building. Machine-cut stone would not last more than twenty years, as machining is fatal to its life. I am of opinion that the whole building could be completed with a 4½-in. veneer of granite for an additional cost of, roughly, £15,000. The Government should call alternative tenders for the work done either in hand-wrought freestone, or in granite. It is possible that if this were done, the extra cost of doing the work in granite might be even less than I suggest. Orders are needed in the haristone industry, and tending would probably be very close. I suggest that the whole building should be clothed in granite instead of freestone, except those parts which are to be finished in brick, to provide for future extension. The usual practice is to use machined stone in commercial buildings, because it makes possible a quicker and cheaper job, but architects who design buildings of a monumental character, such as churches, &c., will not permit the use of machined stone. So porous does the process of machining make the surface of the stone that disintegration commences immediately. One large firm of architects in Sydney, Hennessy and Hennessy, will not permit machined stone to be used at all. It would cost not less than

£15,000 to cover this building with hand-wrought freestone. Machines have now been introduced for working granite, and have reduced the cost very materially. Axe-finished granite would be slightly cheaper than that finished as I suggest, but I should not recommend it for this building. During the last three years the price per foot of worked granite has been reduced approximately 20 per cent. That is for comparatively small buildings. On a building such as this, where there is a good deal of repetition, the reduction might be even greater. I do not think that any one would recommend using a freestone veneer only 6 inches thick, because the water would come right through it to the brickwork behind. Nothing less than a 3-in. veneer should be used. My experience of freestone in Sydney is confined to competing against it in the market. I do not think that any of the freestone is durable enough for use in monumental buildings. In Sydney its life can be measured in years, as can be demonstrated in any cemetery or public building. It has a definite, maximum life of 100 years. Granite, in comparison, is practically everlasting. I examined the Goulburn granite, and it would cost 20 per cent. more to work it than to work Uralia granite. It is not the first cost of quarrying that counts, but the cost of bringing the stone to a finished state. Our experience on large buildings in Sydney is that Uralia granite is the easiest and cheapest to work of any granite on the Australian market. I have seen the stone taken from the Fairy Meadow quarry at Canberra. It is a very beautiful stone for inside decoration, but is useless for outside work. All our Australian limestones are finely marked with mud veins. Where limestone has been used for outside work on buildings in New South Wales it has gone to pieces within ten years. Many examples of this can be seen around Sydney. A glaring instance is provided by the light standards outside the General Post Office in Martin-place. After the standards had fallen to pieces a number of times, they had to be replaced by concrete ones. For inside work, these mud veins can be sealed with shellac, and are not then susceptible to atmospheric changes.

56. *To Senator Reid.*—I have no personal experience in the use of Gosford stone; both Gosford and Hawkesbury stones are much the same in texture. Experience has shown that all freestone is affected by planing. Freestone is only hard silica, and the action of the plane is to scrape and bruise it, sometimes to a depth of half an inch. Even granite rock, if struck with a hammer, will bruise to a depth of 1 inch. The same effect is produced on freestone by planing, except that the stone does not go to pieces immediately. I do not say that this is the inevitable affect of machining freestone, but it has certainly been the effect up to date. I do not know by what process of reasoning it can be arrived at that freestone will become harder and more durable by exposure. Freestone, when quarried and used in a building, is not in process of formation, but disintegration. I should be open to conviction if I had ever observed any freestone getting harder as the result of exposure to the weather. The action of machining granite is totally different from that employed in machining freestone. It is a rubbing motion instead of a blow. Granite is sawn, and is then treated with horizontal carborundum wheels, which merely rub the surface down. The polished surface of granite is impervious to water. If the surface were crushed or wounded water would be able to get in. This can be demonstrated by striking a piece of polished granite with a hammer. Such a blow inflicts a star-shaped injury on the surface, and through this water may penetrate. The effect of machining freestone is to make an abrasive cut which affects the stone to a depth of half an inch. That makes the surface of the stone much weaker than the underneath strata. When disintegration commences, the whole surface comes

away in a fluke. Granite is not subject to the same injury. There are only two ways of working freestone; one is with a planing machine, the other with a chisel. My estimate of an extra £15,000 to clothe the building with granite is for the job finished on the building. If the question of cost is paramount, I suggest that the base of the building, at any rate, should be done in granite. The additional cost of that would be slight. A 4-ft. granite base would be sufficient to prevent weathering. With granite facing each stone is fixed on separately and carries only its own weight.

57. To Mr. Gregory.—Before freestone can be used for building, it must be brought to a true surface either by hand or by planing. The only other way is to saw it. Freestone is never polished. It is not usual to saw freestone here, and then rub it down. It is usually sawn, and then planed. I do not agree that there is a building in Sydney over 40 years old in which the sandstone is still good. After 40 years any building finished in sandstone would become shabby. The surface of the stone would come off, and you could not reface it without refacing the whole building. In St. Mary's Cathedral, in Sydney, erosion has taken place inside the building to a depth of 4 inches. That cathedral was built of the best sandstone ever quarried about Sydney. The stone carries the moisture through, and erosion takes place both inside and outside. The stone used in St. Mary's is from 2 feet to 3 feet thick. The moisture travels through the joints between the stones. I should say that the atmospheric conditions, as they would affect stone, would be worse in Canberra than in Sydney, because there are greater extremes of heat and cold in Canberra. We have not in New South Wales a freestone of as good a quality as that used in St. Paul's Cathedral in London. In Sydney the average commercial building is rebuilt after 30 years, but the building we are now considering is required to stand for the next 300 years. If any witness has told this committee that freestone will last up to 10 years in Sydney, I suggest that he should be called upon to substantiate his statement. The ornamental work proposed to be done on this building could not be carried out in freestone. It would all be weathered away inside five years. If the ornamentation is to be permanent, it will have to be done in bronze. The Sydney General Post Office has been erected over 40 years. Compare the granite steps at the entrance, after 40 years of hard foot traffic, with the stone walls which have been subjected only to erosion, and it will be seen which is the most lasting material. Many of the stones in the steps were renewed the other day, and the maximum wear was half an inch. If we had a close-up view of the ornaments on the building we should see that a tremendous amount of damage had been done to the freestone by weathering, from a distance of 50 feet they look all right, but from a close-up view such as the observer would have of this building, it could be seen that the amount of damage was very great.

58. To Senator Payne.—Most of the buildings in Sydney which are 40 years old were built of hand-worked stone, and even they have suffered seriously from erosion. Planing machines were not in use 40 years ago. The easiest way for the committee to ascertain the difference between the cost of freestone and granite finishes for this building would be to call competitive tenders. It would not cost anything, and would give a good idea of the relative cost of these materials, information which might be of use in this and other contemplated work. My experience in building stone has been confined to New South Wales.

59. To the Chairman.—During the last three years the use of granite for building in Sydney has increased by 300 to 400 per cent. It is coming into general use

where permanence, consistent with reasonable cost, is to be considered. In the case of the building Uralia granite will be used for the base, and synthetic granite for the rest. That is the only building I know of in which synthetic granite is being used. In that case, it was chosen because it was necessary to get the work done quickly. It had to be completed in six months, and it was impossible to get other material within that time.

The witness withdraws.

David Allen Alexander, Director of Odgings Ltd, Stone-masons, sworn and examined.

60. To the Chairman.—I had an opportunity to-day of examining the plans for this proposed building. This is particularly plain work. From the rough figures I took this morning, we estimated that it would cost about £30,000 to finish the building in granite. By that I mean substituting granite for freestone wherever the latter is shown in the plan. Roughly speaking, the cost of finishing in granite is about double that of finishing in freestone. Freestone would cost about £15,000 for this building, while granite would cost about £30,000. The estimate I have given is for the work complete on the building.

61. To Mr. Francis.—Speaking as a citizen, and not as a stone merchant, I believe that a building of this kind should be finished in granite. Let us compare the different material commonly used in the building trade. Freestone is common from every aspect; marble is a grade higher; trachyte a grade above that; while granite is the best of them all. Any architect will tell the committee that. For a permanent building such as the Government Savings Bank in Sydney, granite has been used to a height of 63 feet from the ground; a 4-in. veneer of stone was used. There are no stones other than the cornices thicker than 4½ inches. For all permanent work in cemeteries, granite is the material chosen. I certainly think that, even for a building of this size, the Public Works Committee would be justified in recommending that the extra money be spent to have the building faced with granite. Canberra is the permanent administrative centre of Australia. It will be a hundred years before the building of the city is completed, and it would be ridiculous to construct your allegedly permanent buildings of a material that would have completed its term of usefulness just when the capital, as a city, might be said to be beginning. It is taking thousands and thousands of pounds every year to protect the Cathedrals of England from erosion, and they were built mostly of Portland and Bath stones, which are harder than anything we have here.

62. To Senator Payne.—In arriving at my estimate of £30,000 for finishing this building in granite as against £15,000 for freestone, I considered only the general difference between freestone and granite costs. Freestone is nearly all machine-cut than to have it machine-cut; but hardly any firms turn out hand-cut stone now unless the architect particularly insists upon it. Hand-cut stone lasts better, and if the committee wants confirmation on that point, let them get evidence from Mr. Hennessy. Let them ask him why he would not permit any of the freestone used in St. Mary's Cathedral to be machined, although he was pushed for time, and the cost of hand-working the stone was much greater. The difference in the cost of facing this building with freestone and granite would be considerably increased if hand-cut freestone were used instead of machined stone. It costs from 15 per cent. to 20 per cent. more to hand-cut freestone.

63. To Mr. Gregory.—In the Government Savings Bank at Balmoral a plain granite veneer 4½ inches thick, with a polished finish, cost 23s. a square foot. That was for imported stone, and the cost of polishing was 5s. a square foot. Local granite could be bought for less, and with a corundum finish could be supplied locally for about 17s. a square foot. I do not agree that this building, even if completely covered with granite, would look severe. A light-coloured material can never look severe. This building, if finished in granite, would not look so severe as if finished in brown Sydney sandstone. A building may look severe as the result of its design, but never as the result of the material of which it is made, if it be light in colour. I presume that no architect would dream of putting sandstone right down to the ground of this building. The damage is done to sandstone, not by the water which falls from above, but by that which comes up from below. In St. Mary's Cathedral you can put your hand under the abutments, particularly on the right-hand side of the High Altar, and scrape away handfuls of the stone. I cannot say whether that is for the want of damp courses. I do not think that an architect like Mr. Hennessy would build a Cathedral without providing damp courses. It may be on a par with old wives' tales, but there is a strong tradition among architects and builders that sandstone will not last if taken away from its natural climate. It certainly is a fact that sandstone sent from New South Wales to New Zealand proved an absolute failure. It may be true that Tasmanian stone has been used with success in Melbourne, but if it is, it must be remembered that in that case it was taken from a colder to a warmer climate. I hope that this building at Canberra will be erected of a lasting material. I would rather see it finished in ornamental concrete than in something that will not stand up to the job. I suggest that the whole of the building should be finished in granite, or, as a minimum, that the base course should be finished in that material.

64. To Senator Reid.—To finish the base in granite up to the window sills, would really be the most expensive part of the granite covering. If the base were taken up to the mould, it should run into about 30s. super. The quote of 30s. is for ashlar on the job. At least 70 per cent. of the work on this particular building would be ashlar.

the committee included residences and other constructions not taken into account on this occasion. The following is the estimate of the cost of the present scheme.

AUSTRALIAN INSTITUTE OF ANATOMY			
Estimate of Cost—Federal Capital Commission Scheme.			
(a) Main Contract—			
	£	s. d.	£ s. d.
Skeleton building	44,034	0 0	
Concrete floors	0,800	0 0	
Stoop facing	15,622	0 0	
Water and sewerage installation	2,104	0 0	
Contingency sum	2,600	0 0	
			71,060 0 0
(b) Direct Services—			
Fire services	304	0 0	
Heating installation	5,000	0 0	
Electrical installation	2,900	0 0	
Lift installation	2,300	0 0	
			11,004 0 0
(c) Administrative charge			
at per cent. on total	82,064	0 0	
	4,978	0 0	
Total			87,042 0 0
(d) Interest charges during tenure of contract			
at per cent. on total for 9 months	3,628	0 0	
Total			91,570 0 0
(e) Services outside of building, but associated with it—			
Keelring, guttering, foot-paths, preparation of site for planting, &c. (half cost, approximately)	1,700	0 0	
Planting of site and garden lay-out (approximately)	2,000	0 0	
Extension of sewer reticulation to site boundary	008	0 0	
Extension of electric supply cable to site boundary	400	0 0	
Extension of fire main to site boundary	30	0 0	
			4,738 0 0
Grand total			96,308 0 0

N.B.—Included in the Skeleton Building are the following permanent fixtures—Library, Bookshelves, all fixed benches to Laboratories and Research Rooms as shown on plans.

CUBAGE AND SQUARE AREA RATES.

Subdivision of Building.	Cubage.	Rate.	Square Area.	Rate.	Price.
					£ per 100 sq. ft.
Job complete (Estimates A and B)	822,890	2 0.05	44,450	186.5	82,884
Job, excluding services (i.e., as Estimate A.)	822,890	1 0	44,450	102	71,950
Laboratory block, complete	337,635	2 0.5	10,834	241	47,100
Laboratory block, excluding services	338,635	2 0.	10,834	108	38,721
Museum (B), complete	456,735	1 6.7	21,900	151.5	69,228
Museum (B), excluding services	428,735	1 5.3	21,900	140	30,784
Loggia, including half wall to quadrangle only	56,750	0 10.67	2,026	50	2,600

N.B.—Squarea areas include galleries and balconies.

The actual estimated cost of the building is £82,064. The grand total of £96,304 is made up of services, outside of the building, but associated with it, which are properly chargeable to it. The amount of £21,080, previously before the committee in respect of a reservation and residences at Yarralumla, is not included on this occasion. I have not had any advice as to what residences will be required, but anything of that nature can be proceeded with at a later date. I could ascertain the requirements if necessary. A residence for the Director would not take nearly so long to erect as the Institute itself. The building of the Institute.

(Taken at Canberra.)

WEDNESDAY, 27TH FEBRUARY, 1930.

Present:

Mr. M. CAMERON, Chairman;
 Senator Payne
 Senator Reid
 Mr. Coleman
 Mr. J. Francis
 Mr. Gregory
 Mr. Jackson
 Mr. McGrath.

Sir John Henry Butters, M. Inst., C.E., M. Am. Soc. C.E., M.L.E. Aust., Chief Commissioner, Federal Capital Commission, sworn and examined.

65. To the Chairman.—I am aware that the committee is investigating a proposal to erect a building in Canberra for the Australian Institute of Anatomy. The site for the building is a semi-circular area on the outskirts of the University area at Acton and right alongside the area allotted to the Australian College of Surgeons. The proposal concerns only the Institute of Anatomy itself. A former proposal that was before E.2194.—4.

is likely to take eighteen months from the date of the commencement of the contract although it may take only fifteen months. The contract will include a penalty for late completion of the job. A residence should not take any more than nine months. I will hand in a complete schedule setting out the details of the differences between this scheme and the one formerly before the committee. In this scheme we provide for 822,800 cubic feet and 44,460 square feet at the total cost of £23,964. The original scheme provided for 498,000 cubic feet and 34,794 square feet at a cost of £92,600. The cubage rate under our scheme is approximately 2s. 6d. The square foot rate works out at £136 10s. per 100 square feet under our scheme and £180 under the old scheme. That is accounted partly for by the fact in the estimate prepared by the Works and Railways Department, insufficient provision is made for heating and electric light services, and none for lift installation. The Director, Dr. MacKenzie, considers it essential that a lift shall be installed. Under the old scheme, a rough estimate of £1,900 was allowed for the preparation of grounds. A more careful investigation has shown this amount to be quite inadequate. I understand that Dr. MacKenzie considers it necessary to have every inch of space that we have provided. Our design will allow of an extension of the Institute by the simplest possible methods. I understand that the Commonwealth is under an obligation to Dr. MacKenzie to provide accommodation for his exhibits. I do not know whether any time was fixed in which that obligation had to be honoured, but I am given to understand that the building is long overdue. I am definitely advised that the construction of it is urgent. Our scheme provides for connecting the building with the existing sewerage reticulation. The Institute will stand on high ground just across the road from Beauchamp House and Hotel Acton, and connexion with the sewerage system of those buildings will be quite easy. I think the £800 that has been allowed for this will be ample. An adequate supply of water is available. We have not taken any precautions against fire other than to provide for the usual fire-hydrant system, and, of course, chemical fire extinguishers will be provided inside the building at various points. We have adopted the standard practice in that regard. Dr. MacKenzie has not suggested that any additional precautions are necessary. The whole scheme is in accord with the Griffin design for the development of the city. The building will be erected upon a commanding site—one of the really good architectural sites of the city. I consider Hawkesbury sandstone a suitable material for facing the structure. It is estimated that the facing will cost £15,523. I could not say offhand how the proposition would be affected by using brick instead of Hawkesbury sandstone. I dweasey the cost would be reduced by only £7,000 or £9,000, for bricks for work like this need to be carefully selected and laid. If the committee is really interested in that aspect of the subject I could obtain a definite estimate. Facing with Hawkesbury sandstone will cost roughly 14s. 9d. per square foot. To use a light coloured granite instead of the sandstone would increase the cost considerably. Our advisory architectural committee, which is composed of five gentlemen of wide experience in both Melbourne and Sydney, consider that the sandstone will give a perfectly satisfactory job. They regard it as permanent in every sense of the word. The life of such a building as we are considering should be 200 or 300 years at the very least. I do not know that you could put a definite life to it. We have had inquiries made in Sydney as to the durability of the Hawkesbury sandstone, and our

advisory committee is quite satisfied with the result. It is probable that the use of granite in place of sandstone would involve an extra cost of at least £7,000.

65. To Mr. Coleman.—I have not very strong views as to the advisableness or otherwise of using a granite veneer for, say, 4 ft. 6 in. up from the ground. On a point like that I would be inclined to follow the advice of our architectural committee. The committee is quite satisfied that Hawkesbury sandstone will give a durable structure.

66. To the Chairman.—I should offer no objection to the use of synthetic stone, but I prefer the Hawkesbury sandstone. I say that on the advice of the architectural committee, which seemed to be quite clear that it preferred natural stone to anything else. I understand that to use synthetic stone would increase the cost of building by probably £2,900 or £3,900 as against Hawkesbury sandstone. The reason for that is that the sandstone can be worked into the building as part of the structure, but synthetic stone would have to be used as a veneer. There is no good quality sandstone in close proximity to Canberra. We have very carefully considered the advisableness of using stone from Fairy Meadow, but it is quite out of the question. The Commission is prepared to proceed with the erection of this building within about 48 hours of the date on which approval is given to the work. Tenders have been called, and are already in hand for the work. These will, of course, remain sealed until Parliament has authorized the construction of the building.

67. To Mr. Coleman.—I cannot recollect the exact type of roof specified for the building, but I think it is certain to be bituminous felt and gravel. That is the standard type of roof for buildings of this description. At the last meeting of the Architectural Advisory Committee this very point was considered, and it was stated that the bituminous felt roof with a protective coating of gravel was the most satisfactory known to science at present. Flat-roofed buildings are never delightful things; they are always a source of trouble. There are no difficulties in the way of the utilization of reinforced concrete for constructional purposes in the Federal Capital Territory. Of course, we cannot generalize on such a subject. If it involves the repetition of form work it is sound and economical, but if it involves the use of forms which would only be required once, it would be ruled out on economic grounds.

68. To Senator Payne.—I have had no personal experience in regard to flat-roofed buildings in Sydney, but our architects have made an inquiry into this subject in Canberra, and we have been advised that the use of bituminous felt with a protective coating of gravel is more satisfactory than the use of neuchatel asphalt. We have had practically no trouble with Parliament House roof since the protective coating of gravel was put on the roof. It has answered very well. We should certainly adopt the advice of our advisory committee of architects in regard to the roofing of a building like this. Parliament House was not designed by us, but we have learned a good deal from our experience with the roof of it. We shall profit by that experience in regard to other buildings which may be erected. I am quite satisfied that this building will be in keeping with the class of structure that has been laid down as being appropriate for Canberra. I do not think that the lift housing which is shown on the plan will be in the line of vision of people who look at this building, unless they are at the top of City Hill or Capital Hill no doubt the lift housing would be seen. But we are making an investigation to ascertain whether it will be possible to put the lift mechanism in the basement. If this

can be done without incurring heavy expense, it will be done. I feel quite certain that people who look at the building from the ground level will not be able to see the lift house. An amount of £2,000 is allowed for the site and the planting of the site and a garden, lay-out, and £1,700 as half cost of heating, guttering, footpaths, preparation of site for planting, &c. The area of the site is 5 acres 3 rods 284 perches, so that it cannot be said that the amount allowed for the garden lay-out is excessive. The site is at present in its natural condition. We have not actually designed the lay-out, but it will certainly not be on an elaborate scale. The Director of the institute is very keen on securing a large area because of the probable extension of the activities of the institution. There seemed to be no substantial reason why a large area should not be allocated, for we have plenty of ground available. If it is discovered in the course of a decade that the area is too large, consideration could be given to the utilization of part of it for some other purpose. In the meantime, the laying out and beautification of the city as for the development that it might be risky to have the freestone facing right down to the ground, I would point out that the drawings and specifications provide for granite to be used on the base course for a height of approximately 7 inches from the ground line right round the building. The soil is clayey shale; the site is a nice gentle slope, and the danger of wind and water is practically nil. The building will be right on the crown of the hill. It can never become damp, and there should be no danger whatever of disintegration.

70. To Mr. Ureghy.—I have always understood that the Director desired his residence to be in close proximity to the institute, if not actually within the area. The height of the lift housing is approximately 6 feet. I understand that the Director is emphatic about that many of the specimens are cumbersome and difficult to handle, and that without a lift there would be a grave danger of breaking or damaging them. They may need to be shifted frequently from the basement to the museum portion, and from the museum portion to the laboratories. We shall eliminate the housing for the roof if it can be done economically. I realize that in a reinforced concrete roof in which provision is made for lanterns as in this building, there is a danger of cracking, but that has been allowed for in the expansion joints. I cannot give you the exact details in regard to these, but the architects will be able to give them when they appear before you. More fall would be allowed for in the roof of this building than was allowed for in the roof of Parliament House. I think of the whole of the flat roof of the new building will be of the same material. It is not likely that the roof over the museum portion would be necessary for this that a facing of granite would be necessary for this building from the point of view of durability. I am aware that most of the trouble with buildings of sandstone from top to bottom in the cities is caused by acids from the city. We are not likely to experience anything of that kind here. There is not likely to be any danger of "wind and water" to this building.

71. To Mr. J. Francis.—Our specifications always provide that Australian materials shall be used. That would apply to the lifts as well as to other equipment. I understand that the trouble with the lifts at Parliament House is not in the lifts themselves, but in the timber; and movement of timber is inevitable with Canberra. The timber in the doorways interferes with the operation of the lift catches. The only way to eliminate that is to eliminate timber from the doors and to use steel frames throughout. We have provided in the specifications for this building that metal

doors shall be used for the lift. A steam-heating installation is provided for. The relative merits of Gosford and Hawkesbury sandstone have been investigated, and I believe our advisory committee of architects, and I believe our advisory committee of architects, do not unanimously favoured the Hawkesbury sandstone on this subject. It has been said that Gosford stone is better than Hawkesbury stone, because the latter has a considerable quantity of vegetable matter in it, but I have heard exactly the same thing said of Gosford stone.

72. To Senator Reid. Dr. MacKenzie was emphatic that a lift should be installed for the reasons which I have already given. Some of the exhibits which will be housed in the building could not be replaced if they were destroyed, some of them are heavy and cumbersome; and all of them are valuable. We are quite satisfied that the building will be in keeping with the plan and atmosphere of the city. Irrespective of what plan and atmosphere of the city, the Hawkesbury sandstone may be done in the future, the Hawkesbury sandstone will not conflict with other structures. There could be no objection to the use of either Gosford stone or synthetic stone, but the architects preferred Hawkesbury stone. Their judgment was formed from wide experience of building in Melbourne and Sydney. There would be any amount of room for a residence within the area allowed for the institute, and also for any future development of the project. I am not sure whether the architects discussed the advisableness of putting in a granite veneer for, say, 4 ft. 6 in. up the wall. If Mr. Waterhouse said that there was little danger of erosion through the use of Hawkesbury stone that might be taken to represent the view of the committee, although I cannot see any objection to the use of a granite veneer on the lower part of the walls to avoid any danger from erosion. The Commission would be guided by its experts in a matter of this kind unless it had some extraordinary reason for doing otherwise. The danger from erosion would not be nearly so great in Canberra as in Sydney, for our rainfall is only half as great as that of Sydney, and there would be no danger whatever on this site from storm water.

73. To Mr. Jackson.—We did not consider the use of steel uprights in this building. The interior walls of it will be ordinary 44 inch brick, and alterations of it could easily be made if they were required. The main strength of the building will be in the reinforced concrete or brick exterior wall. It is not likely that there will be any need to make many changes in the interior of the building, for it is of quite a different nature from the building for it is to be submitted to the committee for report very shortly. The other building will probably be liable to many interior changes and this has been kept in mind in preparing the design, but that is not the case with this building. I should not like to express an opinion as to whether the use of both granite and freestone in the walls of this building would interfere with it from the artistic point of view. I should prefer to be guided by the architects on a point like that. I do not know that a very great cost coloured stone. The specifications provide for light-coloured stone to be involved in using a little granite in the walls just above the footings.

74. To Mr. McGrath.—This plan is exactly the same as the one submitted to the committee prior to the discussion of Parliament. We have thoroughly examined the Fairy Meadow project and have had the advice of expert quarrymen in regard to it. We are advised that the stone is useless from what is known as the dimension-stone point of view. It would be impossible to get sufficient dimension-stone out of it to make it worth while to persevere with its development. I believe it is correct that the quarry has cost the Government altogether something over £60,000.

To-day it is merely a pastoral proposition, and I think it is likely to remain so for a good many years. When the proposition for the construction of residences was put before the committee, it was proposed to build two residences on the reservation near Yarralumla and one near the Institute. If the Director's residence is put on the site of the Institute and in proximity to it, it will cost much more than would otherwise be the case. We are prepared to proceed with this job immediately it is sanctioned by Parliament.

75. *To Mr. Jackson.*—Prices in Canberra are stable at the moment.

76. *To the Chairman.*—From the aesthetic point of view this building would be a delightful addition to the architecture of the city. Light stone has been deliberately chosen. Costs in general in Canberra are stationary at the moment; they approximate the costs in other cities of the Commonwealth plus 10 per cent. We can never expect to get below this because of the difference in wages here and the cost of material.

77. *To Mr. McGrath.*—I would not be favorable to the Director's residence being placed on the site of the Institute unless very substantial reasons were given for putting it there. If it were built close to the institute, but on another site, it would cost a great deal less than if built on the site of the Institute itself. If it is put on the site of the Institute it must be in conformity with the plan.

78. *To Mr. J. Francis.*—The decorative scheme is to be carried out in terra cotta. The costs involved in the Fairy Meadow quarry include a considerable amount for legal charges and were incurred, I suppose, ten or twelve years ago.

(Taken at Canberra).

THURSDAY, 23RD FEBRUARY, 1929.

Present:

Mr. M. CAMERON, Chairman;

Senator Payne	Mr. Gregory
Senator Reid	Mr. Jackson
Mr. Coleman	Mr. McGrath.
Mr. J. Francis	

Walter Haywood Morris, designing architect, Federal Capital Commission, sworn and examined.

79. *To the Chairman.*—I am responsible for the plans of the Institute of Anatomy now before the committee. Since the committee considered plans for this building last year certain modifications have been made in them. The chief alteration is in the colonnade. In the original plan we provided for a wood covered way to the internal quadrangle with a tiled roof, but later we found that a sloping roof would not be suitable because light had to be admitted to the rooms at the back of the administrative section. We decided that a flat roof would be better. We also thought that a cement finish to the interior walls would be more in harmony with the external finish. We have, therefore, provided for brick piers, cement rendered, and for a flat concrete roof. To obtain light to the rooms we have provided for flat glass lights in the roof itself. The other main alteration affects the roof structure to the museum. In the original scheme we had a steel roof truss with a slightly sloping roof and roof lights to light the museum. The lights were to be near the wall and not in the centre of the roof. When the original plans were in course of preparation we discussed whether we should have side lighting or roof lighting. Owing to the depth of the roof truss—about 5 feet—side lighting would have meant raising the height of the building to get windows of sufficient height to light the rooms properly. For that reason we

then decided on roof lighting. The matter has been further investigated and we now find that we can get a single rolled steel joist, only 24 inches deep, to span the 62 feet. That has diminished the height by 3 feet so that space is available for windows. The amended plan therefore provides for side lighting, which is preferable. The new plan also gives a roof of less depth. The other alterations comprise minor adjustments chiefly, affecting the sizes of rooms. There has been a slight alteration in the roof lanterns to the various rooms. In the preliminary drawings a glass roof to the entrance hall and the library was provided. We have now substituted an opaque top with glass side lighting. The modifications of the roof design will mean a decrease in the cost, the alterations to the colonnade involving a slight increase, while the other alterations do not affect the cost to any extent. Taken as a whole, the altered design will be less costly than the original. The following is a description of the building now proposed:—

The building originally termed the National Museum of Australian Zoology, now called Australian Institute of Anatomy, comprises chiefly two sections—

(a) that devoted to administration and research, termed the administrative block; and

(b) that devoted to display of specimens, termed the museum block.

The administrative block consists of—

(1) Basement, containing osteology room, boiler room, fan rooms, lavatory, strong-room and elevator from storage space.

(2) Ground floor, containing entrance hall with attendant's booth and stall, anthropology room, histology room, director's room, secretary's and waiting room, research room and lavatories, library and lecture room, two staircases and elevator connecting with upper floor.

(3) First floor, containing dissection room, osteology room, artist's and photographer's room, with dark room, six research rooms and cinema projection and rewinding rooms.

(4) Flat roof, with staircase access.

The museum block is made up of two units, each containing—

(1) Basement for storage;

(2) Ground floor for exhibition of specimens;

(3) Gallery.

The construction proposed is as follows:—For walls, reinforced concrete footings, as shown on the sections, or as may be found necessary when trenches are excavated. External brick walls, solid to ground level, ground level to parapet to be faced with stone. The walls to the quadrangle to be solid brick, from footings to parapet and from ground to parapet to be rendered in cement. Internal walls and partitions to be of brick.

Floor to Administrative Block.—Basement to have concrete floor, damp-proofed with asphalt and finished cement rendered.

Ground floor to be of reinforced concrete.

Entrance hall, corridors, and lavatories finished in tile or suitable paving, remainder covered with wood flooring.

The entrance steps to be of granite or other approved hard stone.

First floor, reinforced concrete, lavatory finished paved, as before, remainder finished in wood. Staircases and projection room finished cement rendered. The flat roof of reinforced concrete with graded topping finished with neuchatel asphalt.

Since the preparation of the drawings and specifications it has been decided to replace the neuchatel asphalt by a system of bituminous layers, which will be more satisfactory in view of the great amount of expansion and contraction due to the varying climatic conditions of Canberra.

Museum Block.—Basement to have concrete floors, damp-proofed with asphalt, finished cement rendered.

Ground floor, reinforced concrete finished with wood flooring. Gallery of reinforced concrete finished with wood flooring.

The roof of the museum block to be constructed of steel girders, covered on top with protected metal on wood purlins and on the bottom with a ceiling of fibro-plaster sheeting. Large double glazed windows to both sides of each museum provide requisite lighting.

Lighting to library and entrance hall secured by glass skylights.

The ceiling heights are as follows:—

Administrative Block—

Basement	9 feet (average)
Ground floor	12 feet
First floor	11 feet

Museum Block—

Basement	8 ft. 6 in. (average)
Ground floor to ceiling ..	24 feet
Ground floor to gallery ..	12 feet

Internal walls throughout to be cement rendered and ceilings finished with cement rendering and coloured white.

The joinery, consisting of doors and the bookcases to library, to be of cedar, black bean or other suitable Australian timbers.

Benches to laboratories to be of pine.

Steel and bronze-framed windows and sashes throughout.

The loggia to the quadrangle to have concrete floor, finished cement rendered, brick piers cement rendered and a concrete slab roof containing skylights near laboratory windows.

The general construction is such as to render the building highly fire-resisting.

A hot water heating system is provided to all main rooms.

Electric artificial light is allowed for to all rooms, entrance portico and colonnade.

The administrative block embraces the entrance hall and library, the whole of which is under one roof. It will have concrete floors and roof constructed with the hollow block system, which not only provides a better insulated floor than one of solid concrete, but also reduces the weight considerably. On the concrete forming the roof there will be a topping of about 4 inches of coke breeze finished with cement rendering, after which three layers of bituminous felt will be laid, and the top then covered with gravel or finely crushed stone. By having three layers of bituminous felt it is hoped to avoid any opening caused by expansion and contraction. The specifications providing for neuchatel asphalt allowed for a fall of 1 inch in every 8 feet. With the new material it will be necessary to have a greater fall, largely because the gravel finish will not provide so smooth a surface as neuchatel asphalt

for water drainage. Dr. MacKenzie informed me that the galleries will not be open to the public as a general rule; exhibits for public inspection would be confined to the ground floor. If public access to the galleries were to be provided for we should have to increase the width of the door. There would be no difficulty in increasing it to almost any width. I am unable to say what price per square foot has been allowed for the stone facings. Quotations were received from the Hawkesbury sandstone quarry for the complete job. Plain work is much cheaper than carved or moulded work. Again all the stone facing is not of the same thickness, the average thickness being probably about six inches. The stone facing is not merely a veneer, as at every three or four courses it is not merely a veneer, as at every three or four courses it will be bonded and become a part of the wall itself. I am satisfied that the veneer will be sufficiently strong. Quotations were not obtained for a complete building of granite. I should not advise the use of carborundum finished granite to a height of 4 ft. 6 in. above the ground level unless the base course detail were amended. The building provides for a moulded base course commencing about 3 feet above the ground. It is more difficult to mould granite satisfactorily than to mould stone of finer texture. In Uralla granite, which is a combination of grey and white aggregate, an arris, or a fine moulding or carving would not show up so well as it would in sandstone. It was never intended that the sandstone should continue right down through the ground. Provision has been made for a granite base course rising to about 7 inches above ground level. At that height there is to be a set-off and the sandstone would continue from there to the top of the building. Tallowwood and jarrah have practically the same wearing qualities, but they are of different colours. Tallowwood has been specified in preference to jarrah because of its colour. It should be strong enough for the museum floor where it will not receive severe treatment. It is hardly likely that any tenderer would attempt to substitute other timbers for tallowwood, seeing that it has qualities which are easily discernible. I discussed with Dr. MacKenzie the possibility of the laboratory section having to be extended that portion of the building. Any expansion, he said, would be in the museum, to house more exhibits, whereas the laboratory section would remain more or less constant. The solid girder now proposed for the museum roof in place of a truss construction was decided upon as the result of investigation as to the best method of lighting the museum. Side lighting is preferable to roof lighting, but as in the original proposal, side lighting would have necessitated increasing the height of the wall to provide windows of sufficient size—about 6 feet high—roof lighting was decided on. Subsequent investigations, however, showed that, by using a rolled steel joist, windows of the desired dimensions could be obtained without increasing the height of the walls. Consequently we now propose to use the rolled steel joists which will cost less than the steel trusses they will replace. The new proposal will provide a girder quite as strong and durable as that proposed in 1928. I am convinced that expansion and contraction have been amply provided for. The design has been prepared in collaboration with Dr. MacKenzie, and the building proposed to be erected will meet his requirements. I am of the opinion that the appearance of many buildings is spoiled by the roof structure necessary to accommodate the elevator machinery. In the plan before the committee the machinery room on the roof towards the front of the building will probably not be seen except from a distance. While the drawings were being prepared we investigated the possibility of housing the machinery in the basement in order to

reader unnecessary a room for the purpose, on the top of the building. We found that different elevator machinery would be required, necessitating additional foundations and consequently a greater cost. For that reason we retained the original proposal to have the elevator machinery on the roof. Further investigation has shown that the additional cost would not be great, and the estimates now before the committee provide for the elevator machinery being placed in the basement. The difference in the cost for the extra foundations should be covered by the amount provided for contingencies. This alteration will eliminate the room on the roof in the front portion of the building. The one at the rear will not affect the appearance of the building to the same extent, but I hope to be able to arrange things in such a way as to render it also unnecessary. From the aesthetic point of view it would be better to have no such rooms on the top of the building.

40. *To Senator Payne.*—The dressing of the freestone is to be done by machines. I have not heard that machine-dressed freestone has a much shorter life than stone dressed by hand. The inclusion of a 7-in. course of granite above the ground level should be ample protection against damage to the freestone. The considerable variations in temperature in Canberra, felt to a greater extent by the comparative rarity and great dryness of the atmosphere, are more injurious to substances subject to expansion and contraction than is the case in any, Sydney. I have no fault to find with neuchatel asphalt, which is generally regarded as one of the best roofing materials. The difference between the cost of neuchatel asphalt and the material proposed to be used would not be great. The specifications provide that tallowwood is to be used for the floors of the museum, while for the floors of the library and other portions of the building jarrah is specified. Tallowwood was specified mainly because of its colour; it is not quite so yellow as the timber used in the floor of this room. Prior to my coming to Canberra I had no experience with Tasmanian oak floors. Tenderers were not given the opportunity to quote for alternative timbers because of the difficulties which would have arisen in dealing with tenders. I have not studied the suitability of Tasmanian myrtle and oak for flooring purposes, and do not know what quantity of Tasmanian myrtle would be available if it were specified. I have seen Tasmanian myrtle, and believe it to be a good timber.

41. *To Mr. J. Francis.*—I have not personally conducted any experiments to ascertain the effect of climatic changes in Canberra on neuchatel asphalt, nor am I aware whether the Federal Capital Commission has done so. I have been with the Commission about fifteen months. It might have been an advantage if experiments had been made. I have not had an opportunity to examine the roof of Parliament House, but I understand that that part of it which is covered with neuchatel asphalt is more satisfactory than any other portion. I have been informed that no provision for expansion or contraction was made when the roof of Parliament House was laid. I am not aware that the roof is still unsatisfactory. To roof the lantern lights with copper would be more expensive than the method proposed. The roof construction will be of concrete, and if the roof of the lantern is also of concrete the work could be done by one class of labour, whereas if copper were used another class of tradesman would have to be employed. The system proposed in addition to being both cheaper and simpler will be quite as effective and durable as copper.

42. *To the Chairman.*—I shall supply to the committee a detailed estimate of the cost of the building as well as the area of land on which it is to be erected.

(Taken at Canberra.)

FRIDAY, 1st MARCH, 1929.

Present:

Mr. M. CAMERON, Chairman;

Senator Payne
Senator Reid
Mr. Coleman
Mr. J. Francis

Mr. Gregory
Mr. Jackson
Mr. McGrath.

Walter Haywood Morris, Designing Architect, Federal Capital Commission, recalled and further examined.

33. *To Mr. Jackson.*—I do not see how any more light would be obtained by covering the lantern lights in metal instead of concrete. The material would be opaque in any case, and light would be admitted only through the glass in the sides. It is not desirable to admit light directly from the sky, because you cannot conveniently avoid admitting the sun's rays also. I do not think that the concrete in the lantern lights will be liable to crack as a result of expansion and contraction due to atmospheric conditions. The area of concrete will be small, and the material will be free to come and go. It will not be like a concrete pavement or roadway where the material is bound in tightly, and has no room to expand. Even if the layers of bituminous felt on the roof did crack or break, there would be no direct opening through the material to admit water, because the strips will overlap, and the joints will be staggered. The main roof structure will be of concrete. It will not matter if the concrete does crack because the covering will be waterproof. In any case, there is no reason why the concrete should crack. There will be a covering layer over it of coke breeze, which will act as an insulation, and keep the concrete cool.

34. *To Senator Reid.*—The coefficient of expansion for concrete is .000006 of an inch per degree of temperature Fahrenheit. Thus, in a length of 180 feet the expansion would be about 1 inch with a range of temperature of 90 degrees. That would be far above the range that would be experienced by the roof of this building. With the insulation provided, the expansion would be very small and the movement of concrete negligible. It might be serious if it could be proved that the length of concrete in this building would expand 2½ inches, but that could not happen when it is covered as we propose. It would be different if the concrete were exposed to the direct rays of the sun. In that case it would get the effect of the maximum range of temperature. For instance, there might be a frost during the night with the temperature down to 32 degrees, or lower, while during the day it might rise to 115 to 120 degrees in the sun. In laying down roads and pavements, movement is generally allowed for by leaving expansion joints between the sections of concrete. In roof construction, however, where the concrete is covered with another material for insulation, the amount of expansion is practically negligible. Personally I have been here only one winter, but I have never experienced more than 14 to 15 degrees of frost. We have had little opportunity of testing by experience the suitability of different roofing materials for Canberra. Serious consideration was given to the roofing of this building, and it was eventually decided, after collecting all the data that we could, that a bituminous felt and gravel covering would make a better roof for Canberra conditions than neuchatel asphalt. That was the reason for altering the original specifications. It was thought that there was a greater possibility of fractures developing in neuchatel under Canberra climatic conditions than under those of Sydney or Melbourne where

this material has been used with success. I have not had an opportunity of inspecting the roof of Parliament House, and my knowledge of what has happened to it is confined to what I have heard. Many things have to be considered in seeking the reason for roof leakage, and there is a risk of possible leakage with most flat roofs. The settling of the building itself would produce cracks in the walls and roof, and will displace the covering. Again, climatic conditions may affect one part of the roof and not another. The lantern lights provided in these plans are really of reinforced concrete. There will be corner piers, and a flat slab roof of concrete, and fitting into the openings are steel-framed sashes which will be glazed. The roof to the building is to be made of hollow blocks, which is really a form of reinforced concrete construction. In a laboratory building, where the rooms are of different sizes, it is sometimes difficult to get a slab to go right across the building without introducing beams. When it is not desired to use beams, the system which we propose here is used. By this means one large beam is really replaced by a series of small ones, within the roof construction thickness itself. This assists the lighting of the building, makes it easier to decorate, and to put in internal partitions. The total thickness of the floor here is from 10 to 12 inches. The beams will be approximately 2 feet 6 inch centres, and the intervening space is filled with hollow blocks made either of coke breeze or gypsum. This reduces the total weight of the floor, and assists the ventilation. There is a final slab of about 3 inch thickness over the top of the blocks. The walls of the hollow blocks are 1½ inches thick, and there is a total thickness of fire resisting material of about 5½ inches. It costs approximately the same to put in a floor of this kind as to put in one with ordinary beams, and you get the advantage of a flat surface, and a better insulated floor. The whole of this building is constructed so as to be fire resisting.

35. *To Mr. McGrath.*—Granite is to be used in this building for the base course, and steps. If members of the Canberra Committee of Civic Design said that no granite at all was to be used, they must have meant that there was to be no granite facing. The granite base course is clearly shown in the drawings. There will be competitive tenders called for the supply of freestone for this building, but the supply of material will be confined to the Hawkesbury River District. We have not definitely decided to specify Hawkesbury stone. I think there are several quarries in the Hawkesbury district, and if we specify that stone, we should have the benefit of competition between the different quarries. So far as I know the quarries there are working individually, and not in combination. I cannot, of course, say for certain whether they would put in competitive tenders if we called for them. I do not know how much a foot they are charging for stone. I referred to stone from the Hawkesbury River district, because I know that in that district we can get grey sandstone. Sydney sandstone is yellow, and it is a feature of this design that the building shall be light in colour. The Commission would not accept the first tender that it receives. The stone will be supplied after tenders have been called. By obtaining a quote from the Hawkesbury River Sandstone Quarries, we have merely arrived at a tentative estimate of the cost of the stone which will be required. I cannot give any information on the point as to whether there is a combine, the members of which will not compete against one another for supplying stone to Canberra. If there is only one company in the

Hawkesbury district, and we specify Hawkesbury stone, we would, I suppose, be at the mercy of that company as regards prices.

36. *To Mr. Gregory.*—In constructing the lantern lights, the corner piers will be built up from the concrete roof, and then the concrete slab will be laid over the piers. The sides will be filled in with steel-framed sashes, and glazed. The length and area of the lantern is so small that expansion and contraction due to atmospheric changes will be negligible. The length is only about 20 feet, and is so small a length of concrete there is no risk whatever. No water can get through where the sides of the lantern join the roof, because the concrete from the roof curves up to meet the sides and is flashed at the angle. I have seen buildings in Sydney finished with concrete roofs, covered with bituminous felt and gravel. I cannot, for the moment, call to mind any particular building with a gravel finish. I know that this form of construction has not been found to be a failure. The proposed fall in this roof was originally 1 inch in 8 feet, but with the altered style of roofing, that fall will need to be increased. The roofs of several Sydney buildings are covered with neuchatel asphalt and bituminous layers, but I have not been personally associated with the construction of those buildings. James Hardy and Campbell's new building is to have a neuchatel asphalt roof, but the work is not yet completed. In no previous work of my own have I specified a felt and gravel covering for the roof. I think, however, that it will make a thoroughly satisfactory job. The two structures on the roof, the housing for the lift machinery, and the pent house to staircase, will not be visible from a near view of the building because of its elevation, but they may be seen from some distance away in the direction of Commonwealth Avenue. I admit that they may, to some extent, detract from the appearance of the building, and the structure for the lift may be done away with by making provision for including the lift machinery in the basement. This could be done at a slightly increased cost. It would be possible, I suppose, to convert these structures into ornamental towers, or something of the kind. It is a matter of expense. The boiler room is not in the centre of the building, but under the lecture room at the end of the administrative block. I am not conversant with the mechanical arrangement, but I have been told by the engineer concerned that its presence there will be in no way detrimental to the lecture room. The roof structure on the right hand side of the front elevation is the cover for the staircase, and it also serves to mask the flue from the boiler house. If the structure were not there, the flue would show up much more prominently. It may be possible to reduce the height of this structure. The roof is not intended as a promenade. Professor Mackenzie especially asked that a portion of the roof be made suitable for preparing his specimens, and for such work as drying and bleaching bones. A sliding top as a cover for the staircase would be awkward. Those working in the building will have to carry material up to the roof, and such an arrangement would inconvenience them. It would be possible to form a well at the half landing level, with a doorway, leaving the top flight of the stairs exposed. This would eliminate the pent house, but would mean making the well water-tight. It would be more difficult, but it could be done.

37. *To the Chairman.*—The granite base course is 7 inches above the ground, and 12 inches altogether. In preparing these plans, I have worked in collaboration with the members of the Committee of Civic Design.

(Taken at Melbourne.)

SATURDAY, 2ND MARCH, 1920.

Present:

Mr. M. CAMERON, Chairman;

Senator Payne	Mr. Gregory
Senator Reid	Mr. Jackson
Mr. Coleman	Mr. McGrath.
Mr. J. Francis	

Professor William Colin MacKenzie, Director of the Australian Institute of Anatomy, Melbourne, sworn and examined.

85. *To the Chairman.*—I am aware that Parliament has referred to this committee for inquiry and report the proposal to establish an Institute of Anatomy at Canberra. The primary idea of the Institute is to house our collection of Australian fauna, which really represents the key animals of the world. Many of the animals represented in the collection are fast disappearing. We already have a large collection. It is essential, in my opinion, that we should take care of, and, as far as possible, add to the exhibits which we already possess. It is from some of the animals in our exhibition that we derive a good deal of our understanding of the human brain. Every one who makes a study of the human brain and other complexities of the human system requires to examine life in its lower forms to understand its significance. To-day every teacher in a university realizes his need of an understanding of our fauna as a part of his teaching equipment. This collection has been made in order that future generations of Australians shall not find it necessary to visit London, Paris, Berlin, or New York in order to study the animals of their own country. I consider that we began to make this collection just in time. It would be regrettable if students had to be told that in order to inspect exhibits of animals of their own country they had to visit New York or some other city abroad. Shiploads of Australian animals have been sent overseas. As a matter of fact, an Australian hall has just been opened in the New York Natural History Museum. We have only one complete skeleton of a Tasmanian native. That seems to me to be most regrettable. In the College of Surgeons, London, they have three beautiful specimens. Berlin, Paris, and New York had far better collections of Australian fauna than we had until comparatively recently. Some people have the idea that it is quite simple to make a collection of this kind. Take the bandicoot, for instance. You find some people who will say "There are numbers of bandicoots about." But when it comes to obtaining a specimen the utmost difficulty is experienced. The bandicoot is gone from Victoria. In fact, it is hard, indeed, to get one in any part of Australia. The bandicoot is necessary in order to enable us to study the basic problem of child birth. It is the key which has unlocked a great deal of the information we have on the problems which face midwifery men to-day. The problem of childbirth is a problem of comparative anatomy, and it is a big one. The solution of a good many of our problems of maternal mortality is to be found in the study of our fauna. I am thankful to say that as a result of the work that has been done we have at St. Kilda road the greatest collection of Australian fauna in the world. We have only been seriously engaged in making it since 1918, although something had been done before the war. During the war I took to the Royal College of Surgeons over 80 petrol tins, and ten tanks full of specimens. These were required largely for the study of muscular problems. I was in Germany before the war, and it was realized then that the study of fauna would be valuable in connexion with the solving of muscular ailments. We all know

now that muscular problems loomed large during the war, and many men who felt quite well otherwise had trouble with their limbs. I suppose we have many more than 10,000 specimens in our jars, and the collection is continually being augmented. Mr. Owen has a very large number of specimens in his microscopic collection. These are invaluable in connexion with the study of cancerous growths. To determine the extent to which a tissue is diseased it is necessary to compare it with normal tissue. This is also necessary in connexion with the study of alcoholic and syphilitic affections. There is nothing in the world like Mr. Owen's microscopic collection. As an illustration of the value of this work I mention the results of our study of a platypus. In our collection we have more than 200 specimens of platypus. This section is also unique. I suppose the value of the collection considerably exceeds £100,000. For the one complete Tasmanian skeleton that we possess I have not the slightest doubt that £3,000 could be obtained in New York to-morrow, and we have other skeletons that would bring that or an even higher figure. I feel sure that as soon as the collection is suitably housed public spirited persons in the community will add to it. Dr. George Horne, of Melbourne, has given us his collection dealing with the stone age man in Central Australia. This in itself is valued at £25,000. The Cambridge Natural History Museum endeavoured to acquire it, but by an extraordinary piece of good fortune it was purchased by the Commonwealth. Mr. Murray Black, of Tarwin, Gippsland, has given us a collection of skulls and implements of Victoria. Dr. Nankivell, of Kerang, has also given us a valuable collection of skulls. Mr. Froggatt, formerly Government Entomologist of New South Wales, offered his collection to the Museum, and it was bought for £500, although it was worth many times more than that. That has been handed over to Dr. Tillyard. As showing the interest which the collection is creating, Dr. Bowden Kloss, Director of the Museum of Singapore, has sent two skeletons of the gibbon and orang for the collection. We are often receiving presents of skulls and various other exhibits. Then we have two annual lectureships in connexion with the work. I am sure that after the collection is properly housed we shall find that it will lead to endowments and so on. The Commonwealth Government entered into an undertaking to house the collection, and we really understood that the building would be ready for it within three years from August, 1924. I have seen the plans of the complete building. They provide ample space for present requirements and reasonable expansion. I am quite satisfied with the layout. I think that the building as at present proposed will serve the needs for at least twenty years. It is conveniently designed. A good deal of work will be carried out in connexion with the Institute. I certainly think that it will function in connexion with the University which is to be built adjacent to it. We shall provide facilities for medical and scientific studies. The Institute will really be a part of the National University when it is established. We shall have a lecture theatre in the building and we hope that it will be possible to arrange for scientific lectures to be delivered each week. We hope to make it a centre like the Royal Institute of London. The lighting and water supply is satisfactory and the laboratory space is sufficient. It is not likely that we shall need to increase the size of the rooms by removing walls. It is more likely that we may reduce the size of some of them. The plan as drawn is quite suitable. It is essential to place a lift in the building. There will be a good deal of carrying to be done. Jars with fluid in them will have to be transported from place to place and so will skeletons and some fairly cumbersome articles. It would not be satisfactory to have to carry these up and down stairs. I consider that a central

heating installation should be made to maintain a uniform temperature in the museums and workrooms. The galleries in the museum will not be open to the public. We think that special specimens may be exhibited in suitable places, but it is not anticipated that there will ever be many people in the galleries at the one time. Consequently the space that has been allowed in the plan for the galleries is sufficient. We have followed to a large extent the plan of the Hunterian Museum in London. Mr. Owen and I went over the Hunterian Museum together very carefully and studied the whole problem. We consider this plan will be perfectly suitable to our requirements. Satisfactory provision has been made on the roof for drying purposes. The means of access to the roof is satisfactory and convenient. I am satisfied that the plan is desirable in every respect. From the aesthetic point of view the building will be an acquisition to the architecture of the Federal Capital.

89. *To Senator Reid.*—We hope that the facilities that we shall be able to provide in Canberra for the study of anatomy will be such as to encourage students to go there from all over the Commonwealth to finish their medical education. I feel sure that graduates will be glad to take advantage of the opportunity of studying in the Institute. To show the value which is attached to the Institute I may say that at the request of the Fellows of the College of Surgeons, which is meeting in Sydney next week, we are taking across 150 specimens for exhibition and study. That shows the direction in which the surgical mind is orientating. In every part of the world increased study is being given to such exhibits as we are collecting in this Institute. Although we send specimens away from the Institute at various times, it would really be better for students to come to the Institute where they could see the whole collection. I have no doubt that in time we shall have American visitors coming to study at the Institute. We are getting quite a number of inquiries from abroad already. Just a few months ago the Cancer Research Institute of Philadelphia, having reached the end of its resources in regard to research, wrote a very long letter begging for any specimens that we could let it have. I am glad to say that we were able to send suitable specimens to it. We have specimens in our collection which are unique and cannot be found in any other collection in the world. To show the world-wide attention which is being given to this collection, I may say that the *British Medical Journal* published an article four months ago which praised it very highly. It is unusual for the *British Medical Journal* to do that. Seeing that the collection is national in its character I think it would be advisable to house it in the National Capital. The provision in the roof for lighting will be more suitable than side lighting. We have followed the example in this connexion of the Hunterian Museum.

90. *To Mr. Gregory.*—The whole collection has been handed over to the Commonwealth and I think that the National Capital is the proper place in which to house it. I believe that this will eliminate State jealousy and will also result in private persons possessing valuable specimens handing them over to the Institute. The Institute will be valuable even to persons who are not able to visit Canberra. We propose as soon as possible to have drawings made of all the specimens and to disseminate such information as we can concerning them. For instance, we shall be able to do a good deal to enlighten the medical profession on the parathyroid gland, which is a small gland, the study of which may lead to important discoveries in the treatment of goitre. It is interesting to know that almost any student could dissect this gland in the platypus in half a minute. To have a gland of this description available and to be

able to compare it with the human gland would mean a great deal to members of the medical profession. We have hundreds of sections of this in the museum. The museum would be valuable to places like Brisbane and Perth, although they would be far removed from it. I was in Brisbane last August to deliver the Bancroft Oration before the Medical Association, and I assured the members of the Association that we should be only too glad at any time to assist them in any way in our power. I was also able to assure Dr. Meyers, who was about to initiate a dissecting room in Brisbane, that we would be glad to do all that we could to assist him. We are in touch with the leading surgeons in Perth and other cities. I believe that if we are to make the Institute of the utmost value to the medical profession of Australia the headquarters should be in Canberra.

91. *To Mr. Jackson.*—I consider it desirable that the Director of the Institute should reside close to it. As we expect that many visitors will come to it, the Director should be available to do what he can for them. If the Director's residence were in close proximity to the Institute, although not on the actual site of it, it would be all right. I am quite prepared to leave the settlement of a point like that to the Committee.

92. *To Mr. J. Francis.*—I have nothing to suggest in the way of improving the plan. Everything that we have asked for has been given. I have no fear that we shall be required within the near future to ask for additions or alterations.

93. *To Mr. Coleman.*—The work of the Institute will not be confined solely to the study of Australian fauna. I hope that we shall be able to house a general comparative anatomy museum in the building. Every specimen that we have so far has some bearing upon the problem of human health or disease. I think there is something to be said for the observation of Dr. Goldthwaite that hitherto we have been so intent upon the study of disease that we have forgotten the study of health. We hope to make health a definite study in the museum. Ultimately we expect to have a human anatomy museum such as Sydney University has. To get a proper understanding of the problems of the human body it is necessary to study life in its lower forms.

94. *To Senator Payne.*—Comparative anatomy is really the basis upon which all efforts will be made in the future to investigate disease. It is essential that the student should study the lower forms of life to understand the human frame. It is proposed to have in conjunction with the Institute a reservation upon which we shall be able to maintain the supply of the lower forms of life. An area of 80 acres has been set aside for this purpose. We do not think that it will be necessary to alter the size or shape of the rooms in this building. It will certainly not be necessary, in our opinion, to enlarge them. We may find it necessary at some time to make some of them smaller.

95. *To Mr. J. Francis.*—I understand that the Commonwealth Government does not insure its property with outside companies. It makes its own arrangements in that regard.

96. *To the Chairman.*—It is part of the agreement that residences shall not be erected on the reservation for the staff. It would not be necessary for these persons to live near the Institute. The Director's residence should be ready for occupation when the Institute is ready.

97. *To Mr. Jackson.*—It would be necessary to have a caretaker for the building, but his residence need not be on the site. The building is fireproof and satisfactory provision has been made against fire. The usual hydrant system and a number of chemical extinguishers will be installed. Nothing in the building

will be highly inflammable. Formerly it was the custom to use spirits to preserve specimens, but now a solution of formalin is used.

98. *To the Chairman.*—In the agenda for the Medical Congress in Sydney the first item has to do with problems of the alimentary system. Problems of the appendix will be considered from their genesis to the time of their greatest development and their final disappearance. The frilled or bearded lizard is most valuable in connection with this study. It is the lowest animal in which the appendix is found. The appendix reaches its greatest development in the native bear. Instances have been found in this animal of an appendix 8 feet in length. The appendix of the wombat is exactly the same as that of the human body. It is interesting to note that we have found wombat in which the appendix has completely disappeared. The wombat, therefore, is getting rid of its appendix without any surgical operation. It will be realized that the study of the conditions in which it occurs may be of the utmost value to students of problems connected with the human appendix. The Mayo Clinic of Rochester is very interested in our exhibition and we have been able to do something to help it. There is a gland in the stomach of the wombat which may have a great deal to do with the solution of the problems relating to ulcers and cancers. This gland disappears in animals higher than the wombat. It is in the beaver. The study may reveal things in this connexion which are of extreme value in dealing with diseases of the stomach in human beings. Our Institute will be most useful in dealing with problems of this description.

(Taken at Melbourne.)

MONDAY, 4TH MARCH, 1929.

Present:

Mr. M. CAMERON, Chairman;	
Senator Barnes	Mr. J. Francis
Senator Payne	Mr. Gregory
Senator Reid	Mr. Jackson
Mr. Coleman	Mr. McGrath.

William Arthur Mordey Blackett, President of the Royal Victorian Institute of Architects, Member of the Federal Council of the Institute of Architects of Australia, and Member of the Canberra Architectural Advisory Committee, sworn and examined.

99. *To the Chairman.*—I have been concerned with the preparation of plans for the proposed Institute of Anatomy at Canberra. The Canberra Architectural Advisory Committee is unanimously of the opinion that the plan prepared will be suitable in every respect for the purposes of the Institute of Anatomy. We agree that Hawkesbury sandstone will be a suitable material for facing the building. I have not specifically gone into the relative merits of Hawkesbury and Gosford sandstone, but the committee has taken into general consideration the difference between Hawkesbury and other sandstones available in New South Wales. We selected Hawkesbury sandstone because it would be lasting and would provide a certain warmth of colour necessary to harmonize the building. I would prefer not to attempt to compare Hawkesbury and Gosford sandstone because I have not made a sufficient study of them. We are quite satisfied that Hawkesbury sandstone will be sufficiently durable for a permanent building in Canberra. I have made an examination of the sandstone in such buildings as St. Andrew's Cathedral, in Sydney, and am quite satisfied that it would be a satisfactory facing for this building. I understand that sandstone used in the offices of the Commercial Banking

Company of Sydney, which were erected 60 or 60 years ago and which were demolished some time ago, has been re-erected as a part of a building for the Sydney University. That is a testimony to its durability. It was not Hawkesbury but, I understand, Pyrmont stone. Our committee considered the advisableness of using granite in the Institute of Anatomy, but it was ruled out because it was felt to be too heavy and not suitable for the type of structure in the design. The construction proposed for this building would be preferable to the steel frame type. It is unnecessary to use steel frames in a building of this description. It is only a two-story building, and we feel that the type of construction proposed is the most advisable. The building will be fireproof and the lighting arrangements are in our opinion quite adequate. The suggested treatment of the roof with bituminous felt covered with gravel is preferable in our view to a roof of mineral asphaltum. We have carefully considered this point. We feel that the bituminous felt and gravel will stand the Canberra climate better than mineral asphaltum. There is a general tendency in Melbourne to use bituminous felt and gravel on flat roofs in preference to mineral asphaltum. We think it will be more lasting and more waterproof than any other form of construction. With the increasing popularity of flying it is necessary to give consideration to the number of projections from a flat roof. We have already drawn attention to that point in regard to this building, though we do not think that it is likely that the roof will ever be used as a landing ground for planes. Nevertheless it is desirable that as far as possible roof projections should be eliminated. I expect that in the future certain defined buildings will be made available as landing places for planes. We have suggested that consideration should be given to the possibility of cutting out the elevator casing projection. This would mean that more machinery would have to be installed in the basement and that would be somewhat more expensive. To some extent the projections on this roof will be masked from observation, for the building will stand on a knoll. The parapet will not act as a kind of mask. Only persons who are at a considerable distance from the building and at some elevation would be able to see either the elevator casing or the pent house. The pent house could perhaps be eliminated if treated like the cockpit of a ship. As far as possible it is preferable to take steps to obviate a serrated skyline. Tallow-wood floors are provided for the building. I have had no personal experience of them, although I am given to understand that they make a first-class floor. I could not say whether tallow-wood has any particular advantage over jarrah, although it is used to floor hospitals in New South Wales. Jarrah makes quite a good floor. It is good practice to use timbers native to the climate in which buildings are constructed, in preference to timbers from other climates. The site of this building is an excellent one from every point of view. In fact I think it is one of the best in Canberra. I understand that as far as possible the Commission is preserving the native trees on the site and working them into the garden scheme. It is an advantage that the building will be in proximity to the National University. The building lends itself to artistic ornamentation. We have given consideration to the provision of adequate fire escapes. The quadrangle treatment of the plan is good practice for a building like this. I understand that the public will not have general access to the building other than to the museums, so that stairways and galleries are adequate.

100. *To Mr. J. Francis.*—I understand that there will not be much need to re-arrange the rooms in the museum. The building will serve a defined function.

It is not like some buildings in which internal rearrangements are desirable frequently, consequently I think the type of partition wall provided in the plan is satisfactory. The fall of the roof is greater than the fall usually provided in flat roofs.

101. *To Senator Payne.*—Steel frames would be much more expensive than the type of construction proposed. The spans of this building are not large and it is unnecessary to use steel frames. I do not think there is anything in the suggestion that has been made that steel frames should be used on economic grounds. I would neither affirm nor deny that freestone buildings in Sydney, which have been erected for 40 years or less, are showing serious signs of wear. I have examined a number of freestone buildings in Sydney and found them to be standing up quite satisfactorily. It seems that the hand dressing of freestone is preferable to the machine dressing of it. Machine dressing seems somehow to shatter the structure of the stone and cause it to scale off. If the pent house were treated cockpit style, I do not think it would appreciably inconvenience the people who use the roof. There should be no structural difficulties in doing the work this way, however, this tower is right in a corner of the quadrangle and would be under less observation, as it is further removed from the facades of the building than the elevator house.

102. *To Senator Reid.*—I know that the roof is needed for drying purposes and so on, and if the staircase went up outside of the pent house it would mean that there would be a little less shelter for the specimens. The cockpit type of structure would mean that there would be a kind of open tank on the roof, but I do not think there would be any great danger from water. Of course one does not like to penetrate a roof like this to any great extent. The pent house is 10 feet high. I would not like to cut it down too much, for one needs reasonable room to stand up in such a place. If it is taken away there will be no protection for the fine. It will cost a little more to install more machinery to do away with the elevator casing. That is the more objectionable of the two excrescences on the roof. I did not know that mineral asphaltum had been more effective on parts of Parliament House roof than the bituminous felt and gravel. In expressing a preference for the bituminous felt and gravel, I was speaking from my Melbourne experience. Mineral asphaltum has been tried and found wanting in Melbourne. The bituminous felt and gravel provides a certain amount of additional protection from fire. The roof specified in this building will be excellent, provided that (and I have no doubt it will be) it is carried out by expert tradesmen and under a guarantee. We have always to bear in mind that the human element enters into a job of this description. There would be little chance of a fire breaking out in the museum; in fact, it is so remote that it is not worth considering. The building is so arranged that the collection will be halved and any fire could be attacked on two sides. There should be no trouble from the expansion of concrete in this roof, and I do not think for a moment that the lantern method of construction provided will cause any inconvenience whatever. If it is properly constructed it will be quite waterproof.

103. *To Mr. Gregory.*—We made careful inquiries before we recommended that sandstone facing should be specified. I have noticed that in certain buildings in Sydney sandstone shows signs of erosion near the footpath. For that reason we have provided a 7-in. course of granite in this building on the ground level. Erosion does not often go higher than that. We specified sandstone higher than that so that the colour scheme should be uniform and we should have a simpler motif. I think that rough milled granite

to a height of 3 ft. 6 in. would be too heavy. It would not be in keeping with the design, which is a delicate expression of architectural art. The whole building will be of a very refined design and something new in Australia. The mouldings and bus reliefs are very delicate. I would not recommend a 3-ft. 6-in. granite course. There should be no trouble from the lantern in the roof provided it is properly fixed. Of course we cannot guarantee anything absolutely, for a workman may forget some trifling fixing. But if water did get in the trouble could be easily remedied.

104. *To Mr. Jackson.*—I have used Tasmanian oak for flooring and have found it good. Myrtle is also good. I have no reason for saying that Tasmanian oak would not be satisfactory in this building, but I should hesitate to criticize tallowwood. In a continent like Australia it will be apparent to everyone that the use of a particular wood is not common to all the States.

105. *To Senator Reid.*—I am in favour of putting in a 7-inch course of granite at the bottom of the building.

(Taken at Canberra.)

THURSDAY, 7TH MARCH, 1929.

Present:

Mr. M. CAMERON, Chairman,	
Senator Barnes	Mr. J. Francis
Senator Payne	Mr. Gregory
Senator Reid	Mr. Jackson
Mr. Coleman	Mr. McGrath.

Sir John Henry Butters, M.Inst. C.E., M.Am.Soc. C.E., M.I.E. Aust., Chief Commissioner, Federal Capital Commission, recalled and further examined.

106. *To the Chairman.*—Our Committee of Design recommended that, as a result of their experience, Hawkesbury sandstone would be the most suitable for this building, and expressed the opinion that it is better than Gosford sandstone. At the present stage, however, it is not proposed to ignore the Gosford product. Our specification provides for the supply of sandstone from the Hawkesbury River district, which includes Gosford. We shall be prepared to receive tenders which provide for the use of Gosford stone, and judge its merits on the samples submitted. After tenders have been received and samples submitted, our architects, in consultation with the Committee of Design, will decide which shall be accepted. We shall not be at the mercy of any combine or monopoly. I understand that two or three firms are turning out what is called Hawkesbury stone. I have not a personal knowledge of the number of firms that are operating, and cannot say whether the principal part of the output of the Hawkesbury River district is controlled by what might be called a monopoly; but we have already received one price which we know is reasonable, and if, in the process of calling for detailed tenders, we see any evidence of the activity of a monopoly, it will be a simple matter to deal with it. It can hardly be said that there is a market price in Canberra for sandstone, because so far there has not been any demand for it worth considering. The price we have received compares favourably with the ordinary market price in Sydney, plus the cost of freight. The price of £14,500 for sandstone mentioned in the specification was arrived at after a quotation had been given by one of the companies. The price of £15,622 includes the granite base and steps. The prices placed against a number of items in the specification are not really fixed prices. It has become a fairly universal practice with architects who undertake really big works to retain a greater measure

of control over a number of items that they had had in the past. Our own experience bears out the view that it is better for the controlling authority to call tenders and control the purchase of certain vitally important items. In the early stages it is very difficult to specify exactly what will be wanted. Take the question of sandstone facing. If that was left in the hands of the contractor, he would use his own methods in calling for tenders, and the only check we would have would be to grant approval of this kind. By calling tenders ourselves and telling him that he must purchase the sandstone from a particular firm, we can exercise a greater measure of control. Take also the item concrete reinforcement. We do not wish any doubts to be raised regarding the quality of that material, and we, therefore, prefer to exercise a control over its purchase. Then, in the case of bronze grilles and steel windows, we can ensure an ample variety of tenders. Usually, as a result of broadcast advertising, our architects can select the actual article they want, and we can be sure that it is the best obtainable.

107. *To Mr. Gregory.*—The contractors do not object to this system; it makes no difference to them. They include a percentage of profit up to a maximum of 10 per cent. in the tender which they submit.

108. *To the Chairman.*—Out of a total of, roughly, £70,000, the sum of £27,000 represents prime cost items; so there is a fairly big contract to start with. They lose nothing, because they get whatever profit they think fit to charge up to a limit of 10 per cent. The advantage from our point of view is that we have absolute control over the method of purchasing and the inspection of goods down below as well as up here. I certainly consider that the Commission purchase more advantageously than a contractor. I should be astonished to learn that we could not. Many builders are tied up with particular firms. A builder may go to only one stone-mason and never dream of purchasing from any other. We would probably have half a dozen. The figure, £94 10s. a ton, set against builder's lime in the schedule, is obviously a mistake.

109. *To Mr. Gregory.*—We are compelling contractors who do work for us to purchase supplies of certain materials from us with the object of reducing our stocks.

110. *To the Chairman.*—The prices are revised from month to month. The price of lime would be more likely about 94s. in Canberra. The practice of compelling contractors to purchase from us has not been applied to all contracts. It was done in the case of our cottage contracts for the very definite reason that we wished to obtain these houses at a cheaper cost, and that object could only be achieved by our buying in bulk instead of each contractor buying individually. The system did not apply in connection with the major contracts outside of that one. When we completed our big programme, we anticipated that we should be able to continue steadily with cottage construction, including the erection of a number of workmen's homes and the erection of the main administrative block. About eighteen months ago our programme was cut down, and we were left with a greater quantity of stores than we required to carry on. We are now specifying that contractors must use that material, and will continue to do so until our stores have been reduced to the lowest possible figure. This practice has not had the slightest effect upon the number of tenders received. It cannot matter to the contractors where they purchase their materials. I say quite definitely that the cost is not thereby increased, because we can purchase more advantageously than the contractor. In any case, as a government organization, we must pay attention to the position of our stores account. The decision of the Government has resulted in large stocks being left on our hands, and we must reduce them. We have

a fixed amount for sandstone at the present stage, but we shall now proceed to call public tenders for the supply of the stone in accordance with the detailed drawings. The reason we have departed from the usual practice and are calling for tenders before approval has been given for the construction of this building, is solely that we may save a month's time. Special circumstances operate in this particular case, and they may not arise again in the next three or over five years. This matter had reached the final stage when the last committee was dissolved. But for that fact it would probably have been passed before Parliament rose. We were being pressed by Dr. MacKenzie to go ahead. We represented to the Government the advisability of placing ourselves in the position of being able to sign up a contract almost instantly by calling for tenders beforehand. The Government adopted that recommendation. Even if the committee wishes to make any modifications we still shall have saved a lot of time. I have not had experience of sandstone or freestone as a facing material in Canberra. I do not think we have any sandstone buildings here. I am satisfied that the price given to us is a fair one compared with the ordinary market price in Sydney. The architect has assured me that he is satisfied with it. He knows perfectly well that in any event public tenders have to be called.

111. *To Senator Payne.*—I am advised that, generally speaking, the prices set against our stores represent the Sydney market price, plus the cost of freight and handling, and holding in our store. Every month a rough revision is made to cope with market fluctuations. There is no danger of the contractor having to pay considerably more than he would if he purchased in Sydney. Any difference would not be worth worrying about.

112. *To Mr. Gregory.*—Tenders will be called in accordance with the specifications and the conditions prescribed. The list attached to the specification is the general store price list. Anything which is included in the specification and which appears on the list, would have to be purchased by the contractor from us. Many other big buildings authorities insist upon cement being purchased from them. They do not handle the ordinary items, nor would we in normal circumstances. I am advised—and I have checked it up in several cases—that most of the departments not only require that the cement used must satisfy certain tests, but also insist upon supplying the cement themselves. We always use Australian cement. I cannot conceive of a situation arising in which a contractor would be compelled to use an inferior cement when one of superior quality was available. The Commission is unquestionably in a position to understand the qualities of cement far better than any contractor in Australia. We call for public tenders for all our cement supplies and handle the matter very carefully. There is no possibility of a better system being evolved. The statement I made earlier to the Chairman was that our designing architect obtained a price from a firm for the supply of sandstone, so as to enable him to check his own estimates. He knows, and that firm knows, that public tenders will be called by the Commission for the stone facing. We could enter into the contract ourselves; or, having called tenders and determined from which quarry the stone should come, we could instruct the successful tenderer to purchase his supplies from the quarry at the scheduled price. Generally speaking all the checks we have made in our stores department have proved that it has purchased extraordinarily well. The main point is that this Institute of Anatomy, in connection with every other public building in Canberra, will be the property of the people of Australia. Owing to the policy of the Government we were landed with bigger stocks than we require for our present programme. We could, of course, adopt some artificial

expedient to dispose of them. We adopt the ordinary procedure of having our stock list kept reasonably up to date, but not meticulously accurate. We do not take notice of daily fluctuations. As it is a case of one public body selling to another, there is no point in taking elaborate precautions to make fine adjustments. It can be taken as definite that our stocks have been well purchased. We have been urged to get them down and have been struggling to do so. In the last seven months we have reduced the value by £35,000, and we wish to effect a still further reduction. If it is made optional for a contractor to purchase from us, the position will be complicated, and, in addition, the inspection work will be much heavier. I should not imagine that with a work like this the cost of stores that would have to be purchased from us would amount to more than £5,000 or £6,000, exclusive of bricks and ore. We can supply cement at the same price as any other Government department, and we can buy reinforcement just as well as they can. An additional charge is added to the New South Wales railway freight for carriage between Queanbeyan and Canberra.

113. *To Mr. J. Francis.*—When tenders are submitted for the supply of sandstone they will be opened by us. The contractor will not know whether the one we accept is the lowest. A tender board, which consists of officers of the Commission, will open the tenders, and they will be considered by a contract board, which consists of a Commissioner, the Accountant, and the head of the department concerned. The system is absolutely watertight. It can be assumed that the integrity of the Commission will have to deal with these matters, there is a check which cannot be improved upon by any other organization. Some of the black beam and blackwood mentioned in the stores price list has been in stock for as long as fifteen years. Items of that nature are being steadily reduced. Unfortunately, there is a retrogression in the quality with the passage of time. A charge of 12½ per cent. is made for holding, and for stores administration. It is added to the cost only once. Provision has to be made for interest and so on.

114. *To Mr. Coleman.*—Our price for bricks is greater than is charged for the Sydney product, because we have to work with different material. In Sydney they have material that can be worked by the dry-press process, which requires a much simpler and much cheaper plant. A much lower maintenance cost is involved, and the bricks cost very much less to burn. Here, the material has to be carefully selected and graded, and the lime in it has to be eliminated. The extra cost for burning is about 16s. or 17s. a thousand, while the maintenance of the plant necessary to produce a semi-plant brick is very much heavier than that of a plant which will make a dry brick. Then we have to pay nearly double for our coal, and our labour cost is 12 per cent. higher. It would not be possible to purchase bricks in Sydney and land them in Canberra at a cheaper rate. On the contrary, the cost would be about £3 a thousand greater. We have had the question of installing different equipment thoroughly explored by brick experts. In the case of an ordinary cottage in Canberra the cost would be £5 a thousand compared with £4. The number of bricks used would be approximately 40,000. Therefore, the extra cost would amount to £40 a cottage. With a steady production our profit on the production of bricks would be 5½ per cent. Unfortunately, however, we have not been able to produce steadily. I hope that during the ensuing year we shall be in a position to go ahead with a steady programme. When we are running sweetly we shall make from 6½ per cent. to 6 per cent.

115. *To Senator Reid.*—I have heard many architects speak very favourably of the bricks produced in Canberra. They are a very fine type of brick. It can safely be said that there is nothing better in Australia. When we are calling for tenders we advertise in the press, and also write to every firm that we know deals in the particular line of goods, drawing their attention to the advertisement. It depends on the class of goods whether we purchase only sufficient for the particular job we are undertaking, or, an additional quantity to keep in stock. We maintain stores which are required from day to day for any work that is in hand. When purchasing cement we obtain that which experience has proved to be satisfactory. As a matter of fact, we use far more cement on items like kerbs and gutters, edgings and footpaths, and general engineering work, than on buildings. All our cement is very carefully tested. We satisfy ourselves regarding the quality of all the material a contractor puts into a job. It was because we supplied materials for the foundations of the Administrative Block, that we found there had been an error, and thus saved thousands of pounds. That is a very strong argument in favour of the Commission supplying material to contractors. One of the reasons why we are calling for tenders for this work, is that we are anxious to get ahead with it. Five architects have recommended the use of freestone in the building. They knew that it was to be a permanent building, and they took into consideration the effect of Canberra's climate. A great deal of inspection is saved when we supply materials. The seasoned timber that we have in stock withstands the climate much better than that which is purchased outside; but even if it moves occasionally on account of the extraordinarily severe effect which the climate has on timber. We do not know at this stage, how much reinforcement will be needed. We have put in an outside figure—£1,300—so as to be on the safe side. The contractor will add his profit to that. If, as a matter of fact, the amount is found to be less, it will come off his price. We can always depend upon a firm supplying the material for which it has tendered.

116. *To Mr. Jackson.*—I do not consider there is the slightest danger of our finding that the supplies of Hawkesbury stone are not sufficient to meet our requirements of the whole of the University block. If we found that once we had determined to use a particular stone there was an attempt to control the supplies or regulate the price, we could very easily put a check upon it. There is not the slightest danger of anything like that happening. I do not entirely agree with Professor Wilkinson. At the present stage we should not draw any very fine lines regarding the colour of the sandstone used in the University group.

117. *To Mr. J. Francis.*—You can go to the Hawkesbury quarry yards and find samples of rejected Gosford stone. Similarly, the Gosford people would endeavour to persuade a prospective purchaser that their product was the best obtainable. We have received five or six tenders.

118. *To the Chairman.*—The most satisfactory tender will be accepted if the price is a reasonable one. If all prices are unreasonable, we shall have to reconsider the whole matter. The fact that one quarry has supplied a price does not bind it to deliver at that price, although probably it would be willing to do so. To give everybody an opportunity, public tenders will be called. I cannot say to what extent building costs in Canberra are higher than those of Sydney. On a previous occasion, we got what we thought was a check and this suggested that we were building more cheaply than they were in Sydney and Melbourne. All other clients we have made indicate that we are within 10 per cent. or 11 per cent. of Sydney. In the event of the

Hawkesbury district sandstone being in the hands of a combine, the Commission would not occupy a worse position than the people of Sydney.

119. *To Senator Payne*.—Comparatively, the price of 6s. 6d. a cubic yard for sand is not high. It has to be taken from the river and thoroughly washed. We do that ourselves. Under the conditions that obtain in Canberra, it is cheap; as a matter of fact, it is cheaper than in most parts of Sydney and Melbourne.

During the first two years, we experienced trouble from what has been called drummy plaster. In nine cases out of ten, that was caused by the use of insufficiently washed and selected river sand. We therefore determined to put in our own plant and to produce a uniform product. There is no possibility of sand of equal quality being supplied at a lower rate than that fixed.

The witness withdrew.

The committee adjourned.