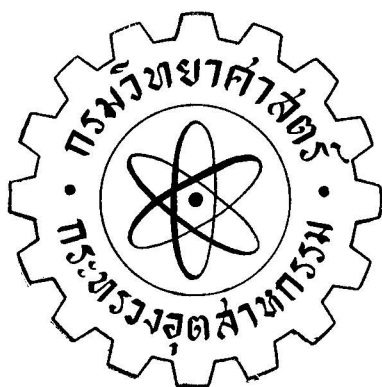


MINISTRY OF INDUSTRY

BANGKOK, THAILAND



DEPARTMENT OF SCIENCE

13th REPORT

FROM 1945 TO 1946

INTRODUCTION

This Report, being the thirteenth of the series, covers the work performed during the years 1945 and 1946. Since I took over this office, three Reports, numbers 10, 11, and 12, have been issued covering a period of seven years from 1938 to 1944. It is hoped that in the future a bi-annual report will be issued regularly.

It will be noticed that the work performed during this period was not of such great a scope as previously. Considering that the years 1944 and 1945 were war years, the reader will understand how difficult it was to keep things going, even to a lesser extent. With shortage of apparatus, equipment and chemicals, since the start of the War the Department of Science, despite these handicaps, tried its best to render good service to the general public as well as to other Governmental Agencies.

In this Report, the analysis of water is omitted, because samples were not sent in regularly and data was incomplete. However, those interested in this item may send in enquiries to the Department which will try its best to supply what information it has at its disposal.

Dr. Charng Ratanarat
Director-General.

Department of Science
Ministry of Industry
June, 1949.

STAFF

1946

Director-General.

Dr. Charng Ratanarat, Dr. phil. nat. (magna cum laude)

OFFICE OF THE SECRETARY OF THE DEPARTMENT

Secretary. Singto Ratanakasikara

Correspondence Section

Head of Section. Pravat Isarankura Na Ayudhaya, Dip. Ed.

Assistant. Miss Tatiya Burananuvata

Library Section

Librarian. Miss Proesiri Bhekanandhana, B.A.

Assistant. Phoon Chakrasen

Accounts Section

Head of Section. Siri Juvidya, B.S.C.

Assistant. Mani Nutaman

Stores Section

Head of Section. Siri Suvanpathma

Assistant. Ong Thadasih

Assistant Scientist. Miss Subanne Ratanasuksa

SCHOOL OF PRACTICAL CHEMISTRY

Director. Dr. Charng Ratanarat, Dr. phil. nat. (magna cum laude)

Senior Scientist. Sangar Sharasuvana, C.D.A. (Hons.)

Assistant Director. Pue Rochanapurananda, B.S (Chem.), Dip. Ind.

Chem.

Assistant Scientist. Mrs. Pathum Thirawatana, B.Sc.

Assistant Scientist. Miss Kamolawan Krishnachuda

DIVISION OF CHEMISTRY

Senior Scientist. Luang Vichien Dhatukarn, L.ès.Sc., I.C. (Poitiers)

Forensic Chemistry Section

- Scientist.* Bumpen Savavasu, B.Sc.
Scientist. Prem Banijpol, B.Sc.
Assistant Scientist. Kehit Sankavasi

Metallurgy Section

- Scientist.* Vongse Naewbanij, A.A.
Assistant Scientist. Miss Sam-Ang Singhadeja, B.Sc.
Assistant Scientist. Sompule Suyasintu.
Assistant Scientist. Lert Sahassananda

Opium Dross Control Section

- Scientist.* Surin Milindalekha, Dip. Pharm.
Assistant Scientist. Chamnong Pugglanandana
Assistant Scientist. Chinda Bunyamit
Assistant Scientist. Miss Rungtavan Bunnag, B.S. (Pharm.)

Water Analysis Section

- Scientist.* Samroeng Vimuktanandana, B.S. (Chem.)
Assistant Scientist. Mrs. Tiraporn Vongsratana

Fuel Section

- Scientist.* Banbota Sudhikam, B.S. (Chem.)
Assistant Scientist. Chong Bunnag.

General Analysis Section

- Scientist.* Miss Priya Chandravekin, B.Sc.
Assistant Scientist. Chalad Virayodhin
Assistant Scientist. Miss Charungchantana Phalajivin, Dip. Pharm.
Assistant Scientist. Sangob Bunyakaith, B.S. Pharm.
Assistant Scientist. Tekaryu Jinaravin

DIVISION OF INDUSTRIAL CHEMISTRY

- Senior Scientist.* Nara Boon-Long, B.Sc., M.S.
Scientist. Miss Snitlagsana Sinatyotharagsa, B.Sc.

<i>Scientist.</i>	Miss Anu Osathanonda, B.S.
<i>Assistant Scientist.</i>	Mrs. Vilai Devakul
<i>Assistant Scientist.</i>	Miss Soodchai Dharmacharoen

Ceramics Section

<i>Scientist.</i>	Manoon Prachankadee, B.Sc. Chem.
<i>Scientist.</i>	Mrs. Bùn-Lom Tevayananda

Food Section

<i>Scientist.</i>	Mrs. Phannipa Paenpatana, B.Sc.
<i>Scientist.</i>	M.L. Anong Nila-Ubol, B.Sc.
<i>Assistant Scientist.</i>	Miss Ratsamiepen Siribaed Bisuddhi, B.S.E.
<i>Assistant Scientist.</i>	Mrs. Virada Thisyamondala
<i>Assistant Scientist.</i>	Puan Proysuwana
<i>Assistant Scientist.</i>	Nimit Vorabandha

Alcohol and Alcoholic Liquors Section

<i>Assistant Scientist.</i>	Miss Viengvibha Kanakakara, B.Sc.
<i>Assistant Scientist.</i>	Narong Eum-Udom
<i>Assistant Scientist.</i>	Miss Chamras Phatamakom

Ores Section

<i>Scientist.</i>	Mrs. Sakuntala Bhodhiprasat, B.Sc.
<i>Assistant Scientist.</i>	Miss Viyada Punyârjun, B.Sc.
<i>Assistant Scientist.</i>	Klow Dejdamong
<i>Assistant Scientist.</i>	Miss Poonsab Paulpantin

DIVISION OF INDUSTRIAL RESEARCH

<i>Senior Scientist.</i>	Yos Bunnag, B.Sc., M.Sc., A.R.C.S., D.I.C.
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Physics Section

<i>Assistant Scientist.</i>	Lau Lauhabandhu, Dip. Ed.
<i>Assistant Scientist.</i>	Miss Suradee Bupavasa, B.Sc.

Testing the Strength of Materials Section

Scientist. Vacant

Workshop Section

Scientist. Parl Na Pombejra, B.Sc.

Assistant Scientist. Miss Yotaka Hinshiranandana

Assistant Scientist. Vichien Sakaramonkola

Investigation of Industrial Processes Section

Scientist. Choo-Sakr Vijirajote, Dip. Ed., B.S. (Ind. Chem.)

Scientist. Miss Nidnoi Sucharitakul, B.Sc.

Assistant Scientist. Amara Prachankadee

Assistant Scientist. Miss Rabiab Benchakarnchana, B.Sc., M.Sc.

Assistant Scientist. Sasi Boonyamanop, B.Sc.

STAFF CHANGES AND MOVEMENTS

New Appointments

1. Miss Rabiab Benchakarnchana, B.Sc., M.Sc., April 23, 1945 :
Assistant Scientist, Investigation of Industrial Processes Section, Division of Industrial Research.
2. Sangob Bunyakaitti, B.S. Chem., July 15, 1946 : Assistant Scientist, General Analysis Section, Division of Chemistry.
3. Miss Sam-Ang Singhadeja, B.Sc., July 15, 1946 : Assistant Scientist, Metallurgy Section, Division of Chemistry.
4. Miss Suradee Bupavasa, B.Sc., July 15, 1946 : Assistant Scientist, Physics Section, Division of Industrial Research.

Officials who have left the Department of Science

1. Aree Supol, October 12, 1945 : Assistant Director General, transferred to Tobacco Factory, Excise Department, Ministry of Finance.
2. Chiad Aphaivongse, March 12, 1945 : Scientist, Forensic Chemistry Section, Division of Chemistry, appointed Secretary General, Prime Minister's Office.

3. Suebsagdi Punya-Uphaphat, May 8, 1945 : Scientist, Ceramics Section, Division of Industrial Chemistry.
4. Miss Chirapha Chalaragse, November 16, 1945 : Assistant Scientist, School of Practical Chemistry, died.
5. Santa Lawhabutr, October 18, 1945 : Assistant Scientist, Stores Section, Office of the Secretary of the Department.
6. Chitt Yamaphai, June 1, 1945 : Assistant, Accounts Section, Office of the Secretary of the Department, transferred to the Customs Department.
7. Siri Tevayananda, September 16, 1946 : Medical Officer, Division of Chemistry, transferred to Tobacco Monopoly, Excise Department, Ministry of Finance.
8. 2nd Lieut. Thon Jarusorn, May 16, 1946 : Medical Officer, Forensic Chemistry Section, Division of Chemistry.
9. Siri Na Nakara, July 19, 1946 : Scientist, Physics Section, Division of Industrial Research.
10. Prathib Prathipasen, February 19, 1946 : Scientist, Foods Section, Division of Industrial Chemistry, resigned.
11. Mom Chomchai Savasti-Watana, June 11, 1946 : Scientist, Division of Industrial Chemistry, resigned.
12. Chula Kanchanalakashana, September 1, 1946 : Assistant Scientist, Alcohol and Alcoholic Liquors Section, Division of Industrial Chemistry, transferred to Government Distillery, Industrial Work Department, Ministry of Industry.
13. Phud Phagdiwichitara, January 1, 1946 : Assistant Mechanic, Workshop Section, Division of Industrial Research, transferred

to the Office of the Under Secretary of the Ministry of Industry.

14. Miss Khlochai Bunyasingh, May 1, 1946 : Assistant Scientist, Metallurgy Section, Division of Chemistry, resigned.

Special Duties

1. Dr. Charng Ratanarat : Member of the National Economic Committee.
Member of the National Air Raid Precaution Committee.
Member of the Canned Food Industry Procuring Committee. (Ministry of Defence).
Member of the Potassium Chlorate Plant Committee.
2. Nara Boon-Long : Chairman of the Selling of Chemicals and Materials of the Potassium Chlorate Plant Committee.
3. Pue Rochanapurananda : Member and Secretary of the Potassium Chlorate Plant Committee.
Member of the Selling of Chemicals and Materials of the Potassium Chlorate Plant Committee.
4. Siri Juvidya : Member of the Selling of Chemicals and Materials of the Potassium Chlorate Plant Committee.
5. Siri Suvanpathma : Member of the Selling of Chemicals and Materials of the Potassium Chlorate Plant Committee.
6. Pravat Isarankura Na Ayudhya : Member and Secretary of the Alcohol Distillery Plant Planning Committee.
7. Choo-Sakr Vijierajote : Member of the Investigation of

- General Activity of Tanning Factory of the Ministry of Industry which was transferred from the Ministry of Defence.
8. Vongse Naewbanij : Attached to the Department of Finance, Ministry of Finance during July-December 1946.
 9. Prem Banijpol : Attached to the Three Soldiers Soap Factory of the Ministry of Industry during May-October 1946.
 10. Chinda Bunyamit : Attached to the Government Purchase Bureau since August 8, 1946 (not yet return)
 11. Klow Dejdamrong : Special duty in the Secretary-General Office, Prime Minister's Office during April-September 1945.
 12. Channong Pugglanandana : Attached to the Department of Secretary-General of the Council of Ministers.
 13. Chula Kanchanalakshana : Attached to the Alcoholic Liquor Factory, Department of Industrial Work, since January 1945.
 14. The Committee for Receiving Aliens Properties seized during Japanese Occupation borrowed 20 officials from the Department with Yos Bunnag heading the group during August 30-October 10, 1945.
 15. Office of the United Nations Cooperation borrowed 3 groups of officials (6 per group) each group working for 3 months commencing January 1946.

GENERAL REVIEW

During the period of this Report, covering 1945 and 1946, War-conditions were most critical, right up to the sudden end on August 16, 1945. The Department of Science, along with other Departments were severely affected. Chemicals ran short. Necessary apparatus and equipment became less and less available due to breakage and depreciation. The Department, moreover had to spare certain of its officials to carry out other more essential jobs. All the Department would do was just to keep running. After peace was proclaimed, there came a period of transferring the Department from its temporary site back to its original site and settling down again. Orders for chemicals, apparatus and equipment were placed abroad, but these were not available right away. Some manufacturing countries were destroyed by War and those which were still in production had to supply many other countries. Consequently, during this period, the Department tried only to restore itself to its former level. Normal functioning was not achieved during this period. Work was also handicapped by shortage of electricity and water, the source of which were largely damaged by air-raids.

It was mentioned in the twelfth Report that certain sections of the Department were moved to the Mater Dei Institute, and certain books and articles were stored at Wat Nang, Thonburi. During this period the Mater Dei Institute needed more space, so the Department had to move once more to the Physics Building, Chulalongkorn University, on January 26, 1945. Chulalongkorn University was chosen, because it had laboratory benches, electricity and water, necessary for the functioning of chemical work. Also at this time, the University was on vacation, so that the place was vacant. On October 1, 1954, the Department moved back to its original location. But as for the storage at Wat Nang, it remained there until the cessation of hostilities.

Another important obstacle to the work of the Department was the shortage of aviation spirit used in the production of gas for

burners. Electricity was not used because the power plant was badly damaged and distribution was irregular. Fortunately, thanks to the Navy and the Air Force, who had some aviation spirit to spare and the Department kept its work going. Later on, it was possible for the Department to purchase aviation spirit in quantity, so that the Department had enough to spare for the Chulalongkorn University and the Pasteur Institute.

The list of the staff showed that during 1945 and 1946 there were 67 officials, from the third grade up. But actually, those working at the Department were less in number. Five persons were engaged in special work, seven were loaned to other Departments and twenty were helping occasionally in other work. Of these 67 officials, three were appointed in 1946.

The number of items analysed during this period was comparable to that of previous years, 2644 samples in 1944, 2427 samples in 1945 and 2065 samples in 1946. These items were mostly sent in by other Government Agencies and private companies for routine analysis. In addition the Department made a start in the investigation of 14 other research topics to be conducted in the future.

The Library did not obtain any more books during this period, but tried to render good service to its own staff and outside users. It is heartening to record here that, the sub-committee of the Caustic Soda Materials Procurement and the Working Committee of Potassium Chlorate Plant, donated 15,000 baht to the Library to buy books in appreciation of the good services rendered by it.

The "Science" magazine, which originated in 1936 for the purpose of spreading the knowledge of Science, was no longer issued shortly after the cessation of the War. It was replaced by the "Industry" magazine, issued by the Ministry of Industry. In the course of its existence, the "Science" magazine was suspended during the War.

Locally manufactured products sent in for certification were mostly cosmetics. The total number was less than that of the previous year, and only a few were certified.

The School of Practical Chemistry was re-opened after the War. The preparatory class was resumed first and followed by the first year and second year classes in May, 1946.

The detailed list of analyses appears later on in this Report, but it is interesting to call attention to the following points: the marked increase in the number of the samples, the use of arsenic in poisoning cases, the analysis of the viscera of the late H.M. King Rama VIII and the examination of the weapon suspected to be used in that regicide case.

During this period the Department also took charge of the liquidation of the Potassium Chlorate Plant which was badly destroyed by air raids. Dr. Prachuab Bunnag, former Director-General of the Department and Chairman of the Committee of the Plant, on leaving the Department to take over the post of Minister delegated the task of this liquidation to the Department. After settling of the accounts of this Plant, the loan, interest and profits derived from its liquidation, were turned over to the Ministry of Finance, which had sponsored the project.

THE LIBRARY

In 1945, all communications were cut off and consequently library book exchanges came to a stop. The Library could neither send its publications abroad nor receive its regular foreign journals. The Library budget was cut down to a mere 500 baht, sufficient only for book-repair.

During this critical period, the Library packed most of its journals and publications to be stored in a place considered safe from bombing. Only a few important books and documents were kept in the building.

After the end of the War in 1945, the Library received publications from the Imperial College of Science and Technology, England, for the first time, which was a good sign heralding future contacts

with foreign countries. The number of volumes received in 1949 increased somewhat but still did not attain pre-war level. To improve the service of the Library, new regulations were drawn up and distributed to different local organizations.

The Library was in use by many outside officials from other Departments. In 1945, there was an increase of 10 outside users and in 1946, 92. Up to 1946, there were 290 outside users altogether. The various organizations utilizing the Library were: the Faculty of Pharmacy, Chulalongkorn University; the Department of Medical Science; the Department of Industrial Promotion; the Naval Science Bureau; the Faculty of Veterinary Science, University of Medical Sciences; the Tobacco Monopoly; University of Agriculture; the Department of Agriculture; the Department of Royal Highways; the Department of Fishery; and the Government Distillery, Department of Industrial Works.

In 1946, the Library gratefully accepted a joint donation of 15,000 baht from the sub-committee of the Caustic Soda Material Procurement and the Working Committee of the Potassium Chlorate Plant.

THE SCIENCE MAGAZINE

The issue of the Science magazine was suspended during the period from January to April, 1946. The last number published was No. 2, of its ninth year. After the War, publication was continued, with No. 3 and 4 combined as one volume and this was issued in December 1946, under the same committee.

The Ministry of Industry decided that a wider field comprising science, industry and mining should be covered by one magazine. Accordingly a new magazine called "Industry" was originated in January, 1947. The Department of Science, being under this Ministry, cooperated heartily and dropped its own publication, the "Science" Magazine in December, 1946, No. 3 and 4 combined as one volume being the last issue.

The staff of "Science" magazine, however, did not consider that their work came to an end, but went on to assist in the publication of "Industry" Mr. Pue Rochanapuranda, at first assistant-editor, then editor of the "Science" magazine was appointed editor of "Industry" in its first year of publication.

THE CERTIFICATION OF LOCALLY MANUFACTURED PRODUCTS

During 1945-1946, 19 kinds of merchandise were sent in for approval, 7 kinds in 1945 and 12 in 1946. Of these 19 kinds, 7 were approved, and of these 7 kinds, 5 had already been approved in the previous year. Most of the products were cosmetics.

The decrease in the number of products sent in for approval, despite the large number found in the market, could have been due to two reasons. Firstly, good-quality products already having a good market, needed no certification; and secondly poor quality products were not sent in, because the manufacturers were already aware of the fact that the quality was not up to standard and would not be approved any way. The Department would like the public to buy only those products approved by the Department, because good sale and good advertising do not mean that the products are invariably of good quality. Manufacturers should also try to improve the quality of their products, because if they want to stay in business, they will have to compete with the foreign-made products available after the War.

Products approved in 1945 :

- (1) Liquid Rubber Cement of Samanloed.
- (2) 1.77 Baby Powder of 1.77 Factory.
- (3) Liquid Rubber Cement of S. Damphithagsa Store.
- (4) The Star Brand Copy Ink of the Star Chemical Factory.
- (5) Black and Brown Shoe Polish of Hongsthong Pradit
Factory.

Products approved in 1946:

- (1) 1.77 Baby Powder of 1.77 Factory.
- (2) Hair Oil of Srisam- Ang Co.
- (3) Hair Cream of Srisam-Ang Co.

THE SCHOOL OF PRACTICAL CHEMISTRY

As has already been reported in the Twelfth Report, the School of Practical Chemistry closed down since 1944, on account of the shortage of chemicals and apparatus and also for the safety of the students. At the cessation of the War, the School re-opened on November 1, 1945, after having been closed for a period of 23 months. Due to the meagre amount of chemicals and apparatus on hand, the School decided to start only the preparatory class first. The training of this class ended in April, 1946. Those passing the final examination joined the First Year Class in the succeeding term.

Meanwhile, the Ministry of Education gave permission to several schools to open a pre-university course of two years, similar to that conducted at Chulalongkorn University. In view of this, the School considered it best to drop the preparatory-course and enroll for the First year class those who had completed the pre-university course.

The School resumed its normal training of the First Year and Second Year Classes on May 23, 1946 with 37 students in the First Year Class and 17 in the Second Year Class.

During this period an important change in the officials of the School took place; Mr. Yos Bunnag, Senior Scientist was transferred to the Division of Industrial Chemistry and Mr. Sangar Sharasuvana, Senior Scientist of the Division of Industrial Chemistry replaced him.

DIVISIONS OF CHEMISTRY, INDUSTRIAL CHEMISTRY AND INDUSTRIAL RESEARCH

The Divisions of Chemistry, Industrial Chemistry and Industrial Research, were still inseparable during this period owing to the

limited number of personnel and lack of equipment. The following is a list of notable accomplishments performed during this period.

Metals and Alloys

Items	No. of Samples 1945	No. of Samples 1946
Tin	541	578
Gold	28	-
Other Metals and Alloys (Antimony, Aluminium, Copper, Lead, etc.)	12	31
Total	581	609

The Department of Finance, Ministry of Finance used previously to send for analysis great quantity of samples of tin for making coins. But after the war, the price of tin climbed tremendously, until its value exceeded that of the coins, consequently the Department of Finance decided to cease minting coins. Because of this the number of tin samples sent in for analysis decreased greatly. On the other hand, however, the number of tin samples sent in by private companies and individuals increased noticeably, owing to the setting up of many private tin smelting plants both in Bangkok and Thonburi. It is noteworthy to report that the samples sent in by the smelters contained a very high percentage of tin.

Opium

During this period the number of opium samples sent in by the Excise Department rose to a peak of 1262 samples, surpassing that of any other previous period. This number, 1086 samples in 1945 and 176 in 1946, included raw opium, cooked opium, mixed opium and suspected opium. With shortage of personnel and equipment this section had to work hard to complete its task.

Poisoning Cases

Specimens of suspected poisoning cases during this period numbered 99, 35 in 1945 and 64 in 1946. The findings were positive only in a few cases, of which arsenic was used in 3 cases and iodoform in one case. Iodoform was an uncommon compound to be used for such a purpose owing to its strong and detectable odour. In this case, two women ate dried curry at home, then felt nauseous and dizzy. They were, however, relieved later on by medical treatment. On close examination of the curry, the officers detected a strange odour and so a sample of the curry was sent in for analysis. Four grains of iodoform were found. The minimum fatal dose varies but it is believed to be 20 grains. This case happened in the Nanglerng District, Bangkok.

The outstanding suspected poisoning case during this period was that of H. M. King Rama VIII, who died on June 9, 1946. Three theories were considered on the cause of his demise: accident, suicide and regicide. An Investigation Committee was appointed to determine the cause of demise. Although it was apparent that death was caused by a bullet wound, the Committee wanted to find out whether or not poison was used also. The viscera was brought in for analysis on June 22, 1946, thirteen days after his demise, by a group of two Thai doctors, a member of the Investigation Committee and a British Military Medical Officer, Capt. V. N. Chaturvedi. The analysis was conducted on the next morning by the officials of the Forensic Chemistry Section with Capt. V. N. Chaturvedi standing by as observer. The result of the analysis showed no general poison in the specimen; this document of analysis was also counter-signed by Capt. V. N. Chaturvedi.

Blood Stains

In 1945, 34 specimens of blood stains were sent in for analysis. Findings were positive in 32 specimens. In 1946, there were 41 specimens of which 30 were positive. The number of specimens was comparable to that of the previous period.

Fire Arms

Routine examination of fire-arms was mainly to ascertain whether or not weapons had been fired since their last cleaning.

In 1945, there were 47 specimens, 31 automatic pistols and revolvers, and 16 rifles, of which 17 specimens were positive.

In 1946, there were 25 specimens, 17 automatic pistols and revolvers, and 8 rifles, of which 15 specimens were positive.

One specimen of a cartridge case was also sent in for examination.

Of very special importance, was the specimen suspected to be involved in H. M. Rama VIII's demise. This weapon was found in the bed besides His Majesty's body. Medical examination showed that His Majesty was killed by a gun wound in the head on June 9, 1946. The Department received the specimen on June 11, two days after the incident.

The weapon was a Colt automatic, 11 m.m., M 1911 AI pistol made by Ithaca Co., Inc., Serial No. 2C 81459.

The officials of the Forensic Chemistry Section went to work immediately and sent their report to the Police Central Investigation Division on June 13, 1946. The examination showed that the weapon had been fired since its last cleaning, but it could not yet be ascertained how long ago the firing had taken place since its last cleaning.

To determine this duration, comparison tests had to be made by firing similar automatic pistols and testing them at different intervals. Using proper reagents, it could be ascertained, how long after its last cleaning a pistol had been fired. Testing of this kind was not usually done by the Department owing to the lack of proper equipment. But since this was a special case, the Department tried its best to carry out such tests. Since the case was still on hearing at the Court of Justice, the Department regretted that it could not yet disclose the results of the tests.

Milk

During this period there were 100 samples of milk submitted for analysis, 11 samples in 1945 and 89 in 1946. Of the 11 samples submitted in 1945, one sample was made locally and was not up to the

legal standard. Of the 89 samples submitted in 1946, comprising 58 samples of sweetened condensed milk, 28 samples of unsweetened condensed milk, 2 samples of fresh milk and one sample of sweetened condensed skimmed milk, 26 samples which were made locally were found not up to the legal standard.

Some of the approved samples were made locally, but since these were submitted by the Department of Public Health, and not by the manufacturers themselves, the Department was not able to determine whether working conditions were according to sanitary regulations.

Coal

The Department of Mines submitted a sample of coal from Rangsit for analysis. The result of analysis was as follows :

Moisture	14.03 %
Volatile matter	51.80 %
Fixed carbon	26.45 %
Total Sulphur	3.34 %
Ash	7.72 %
Calorific value (as received)	4,260 Cal./gm.

or

Calorific value (calculated on dry basis) 4,956 Cal./gm.

Preparation of Barium Sulphate

During the War, a shortage of barium sulphate was felt in all hospitals. Barium sulphate is used for tracing digestive path in X-ray work. The Department considered that it could alleviate the situation by providing hospitals with barium sulphate prepared in its laboratory. Sixty kilograms were sent to Siriraj Hospital and 3.4 kilograms to the Clinic of the Tobacco Monopoly. The prepared barium sulphate was found satisfactory and comparable to foreign products.

Water

During this period, the Water Analysis Section analysed specimens of water from Chao Phya river, the sea, and other rivers as detailed below :

Source	No. of Samples	
	1945	1946
City Water Work	115	143
Chao Phya River	26	28
Sea Water	252	243
Miscellaneous Localities	3	15
Total	596	629

Special Studies

In addition to routine work, the Department also attempted to carry out certain special studies on various subjects in so far as time and facilities permitted. The following is a list of some of the subjects studied during this period.

1. Bleaching of rice straw pulp.
2. Preparation and method of employment of dyes from indigo lac, and sappan-wood.
3. Preparation of alcoholic liquor, by various fermentation processes.
4. Preparation of barium sulphate for use in X-ray work.
5. Preparation of zinc oxide for making paint.
6. Bleaching of hemp fibre and other fibres.
7. Hydrogenation of oils.
8. Study of opium, kancha, and krathom (*Mitragyna speciosa*).
9. Manufacture of rubber goods, specially rubber stoppers for laboratory use.
10. Study of lemon grass and citronella grass.
11. Making starch from bananas, mangoes, potatoes, kachio (*Curcuma* sp.), taro, and Kloey (*Dioscorea doemona*).
12. Study of clove.
13. Purifying of seed lac for making shellac.
14. Preparation of essential oils from lemon and orange skins.

Certain of these studies were only in the initial stages and final results were still to be determined. When conditions return to normal, the Department hopes that these investigations will be completed in due course.

ANALYSIS STATISTICS
(A) Source Classification

From	Items	Number of Samples	
		1945	1946
Ministry of Defence	Drinking water	-	2
	Sea Water	252	243
	Fuel Oil	-	1
	Lubricants	14	1
	Metals	-	6
	Ore	1	-
	Chemicals	4	5
	Soaps	-	4
		271	262
Ministry of Agriculture	Sea water	-	1
	Fuels	-	2
	Vegetable oil	1	-
		1	3
Ministry of Communication	Fuel Oils	-	2
	Lubricants	2	7
	Charcoals	-	4
	Metals	2	17
	Chemicals	2	1
	Vegetable Oils	11	14
		17	45

From	Items	Number of Samples	
		1945	1946
Ministry of Finance	Fuel Oils	8	159
	Lubricants	-	5
	Morphine or Opium Suspects	7	25
	Poison Suspects	-	11
	Metals	283	422
	Gold	28	-
	Ores	-	100
	Chemicals	-	11
	Opium	1,086	176
	Vegetable Oil	-	1
	Alcoholic Liquors	2	130
	Food	-	54
	Pharmaceuticals	1	4
	Fabrics	-	3
	Shellacs, Seed Lacs	-	4
Dye	-	1	
		1,415	1,106
Ministry of Economic Affairs	Fuel Oils	74	-
	Chemicals	3	-
		77	-

From	Items	Number of Samples	
		1945	1946
Ministry of Interior	Drinking Water, Industrial Water	106	157
	Lubricants	2	-
	Blood Stains	13	54
	Fire-Arms and Ammunition	48	28
	Morphine or Opium Suspects	-	6
	Poison Suspects	21	14
	Specimens of Internal Organs	2	1
	Other Objects under Suspect	35	29
	Ores	4	-
	Chemical	-	1
	Rock	-	1
	Gum	-	1
			231
Ministry of Justice	Morphine or Opium Suspects	1	2
		1	2
Ministry of Public Health	Drinking Water	6	6
	Morphine or Opium Suspects	-	11

From	Items	Number of Samples	
		1945	1946
Ministry of Industry	Poison suspect	-	1
	Medicinal Suspects	1	8
	Chemicals	2	-
	Vegetable oil	1	-
	Food	4	35
	Pharmaceuticals	2	1
		16	62
	Sea Water	1	-
	Lubricant	1	-
	Coal	1	-
	Fuels	-	2
Ores	23	43	
Chemicals	1	36	
Opium	7	-	
Alcoholic Liquors	5	1	
Earth, Rocks	9	8	
Merchandise for Certification	7	12	
	55	102	
Bangkok Municipality	Drinking Water, Industrial Water	40	38
	Poison Suspects	9	-

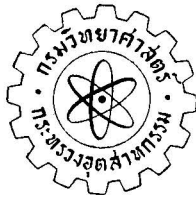
From	Items	Number of Samples	
		1945	1946
Semi-Official Companies	Chemicals	10	12
		59	50
	Fuel Oils	-	5
	Lubricants	2	44
	Fuels	6	-
	Valuable Metal	1	-
	Ores	-	5
	Chemicals	2	3
	Rock	1	-
	Miscellaneous	-	1
	12	58	
Public (Firms and Individuals)	Water	2	4
	Fuel Oils	1	3
	Lubricants	5	-
	Charcoal	-	1
	Blood Stain	-	1
	Poison Suspects	2	6
	Specimens of Internal Organs	-	3
	Other Objects under Suspect	-	4
	Metals	164	160

From	Items	Number of Samples	
		1945	1946
	Ores	49	99
	Chemicals	21	19
	Fats	1	10
	Vegetable Oils	2	11
	Alcoholic Liquors	4	-
	Food	9	14
	Animal Feed	-	1
	Fabrics	3	-
	Pharmaceuticals	5	10
	Rock	-	1
	Damaged Merchandise	3	-
	Shellacs, Seed Lacs	-	21
	Gum	-	2
	Dyes	1	2
	Soaps	-	2
	Tannin	2	-
	Miscellaneous	1	-
		272	383
	Total	2,427	2,365

(B) Kind Classification

Items	Number of Samples		
	1945	1946	
Merchandise for Certification	7	12	
Water	408	451	
Fuels	Fuel oils	83	170
	Lubricants	26	57
	Charcoals and Coal	1	5
	Fuels	6	4
Objects under Suspect	Blood Stains	13	55
	Fire-Arms and Ammunition	48	28
	Morphine or Opium Suspects	8	44
	Poison Suspects	32	32
	Internal Organs	2	4
	Other Objects under Suspect	36	41
Metals	478	605	
Ores	77	247	
Chemicals	45	88	
Opium	1,093	176	
Edible Vegetable Oils, Fats, Vegetable Oils	15	36	
Alcoholic Liquors	11	131	

Items	Number of Samples	
	1945	1946
Food	13	104
Pharmaceuticals	8	15
Earth, Rocks	10	10
Fabrics	3	3
Damaged Merchandise	-	9
Shellacs, Seed Lacs	-	21
Fertilizers	-	4
Gum	-	3
Dye	-	1
Paints	1	2
Soaps	-	6
Tannins	2	-
Miscellaneous	1	1
	2,427	2,365



*With the Compliments
of
Department of Science
Ministry of Industry
Bangkok, Thailand*