names, often better than Siebold. However, detailed description such as locality and occurrence could only have been recorded by Siebold or Bürger as they were the originators of field notebooks or specimen lists by Siebold or Bürger were used by the UL during identification and characterization, which UL used in the course of his identifications. Such notebooks are hoped to be discovered in the near future.

As mentioned above, only 231 specimens in Hoffmann's list correspond to those in Siebold's collection; the remaining 307 specimens cannot be identified. Most peculiar is that none of the 144 specimens in Hoffman's 3rd section was located in the collection at the Naturalis. While 190 specimens in the 1st section and 41 specimens in the 2nd section were good matches with the entries in the collection database, no matches were found in the 3rd section. The specimens in the third section should have been stored in the "Reichsmuseum" (Royal Museum). If "Reichsmuseum" indicates "Rijksmuseum van Natuurlijke Historie," then the specimens should have been stored in Naturalis. After an eight-year search at Naturalis, there is almost little possibility of finding another Siebold collection there. It may therefore be more reasonable to think that "Reichsmuseum" may apply to an institution rather than the "Rijksmuseum," such as in Amsterdam. To discover the missing Siebold mineral specimens, we hope to trace the route of the specimens to other national museums in the Netherlands in our future research.

Mineral specimen list by Schlegel

Researching the Siebold archive of Naturalis, we found a list of mineral specimens written by Schlegel. Hermann Schlegel (1804-1884) was the second director of the Royal Museum of Natural History. He was a zoologist who, together with J. C. Temminck and W. de Haan, contributed to the publication of Siebold's "Fauna Japonica" . It is not clear why he made a list of the mineral specimens in the Siebold collection. Though no date is mentioned in the list, Schlegel worked at the Museum from 1825 to 1884, at that period when extensive Siebold collection were shipped at the end of his first expedition landed at the port of Antwerp in 1830 and moved to Leiden shortly thereafter. Therefore, this document may demonstrate that Siebold's mineral collection was stored in the Museum at some time during that period. The mineral list comprises three pages and is written in French. We show the list translated in English.

Catalogue

Oryktogeognostic (old word for ‘mineralogical’) collection of Japan

Reported by Dr. Von Siebold

By H. Schlegel

1. Genus Sulfur
    1. Volcanic sulfur / 8 varieties from different localities
2. Genus Quartz
    2. Rock crystal / Amethyst / 16 varieties from different localities.
    3. Quartz / 9 varieties from different localities.
    4. Jasper / 1 variety from different localities.
    5. Red massive quartz / Orthoclase / 2 varieties from different localities.
    6. Chalcedony / 5 varieties from different localities.
    7. Agate / 4 varieties from different localities.
    8. Petrified Wood / 18 varieties from different localities.
3. Genus Antimony
    9. Native antimony / 1 variety from different localities.
    10. Antimony sulfide / 3 varieties from different localities.
4. Genus Arsenic
    11. Red Arsenic sulfide / 1 variety from different localities.
    12. Yellow Arsenic sulfide / 2 varieties from different localities.
5. Genus Mercury
    13. Mercury sulfide / 1 variety from different localities.
6. Genus Silver
    14. Native silver / 1 variety from different localities.
7. Genus Bismuth
    15. Native bismuth / 1 variety from different localities.
8. Genus Zinc
    16. Zinc sulfide / 1 variety from different localities.
9. Genus Lead

17. Lead sulfide / 7 varieties from different localities.

18. Lead sulfate / 1 variety from different localities.

10. Genus Copper

19. Native copper / 1 variety from different localities.

20. Copper sulfide / 1 variety from different localities.

20. Chalcopyrite / 16 varieties from different localities.

21. Copper oxide / 3 varieties from different localities.

22. Copper sulfate / 1 variety from different localities.

23. Copper carbonate / 12 varieties from different localities.

11. Genus Cobalt

24. Cobalt arsenide / 1 variety from different localities.

12. Genus Iron

25. Iron sulfide / 3 varieties from different localities.

26. White iron sulfide / 1 variety from different localities.

27. Iron arsenide / 5 varieties from different localities.

28. Hematite / 5 varieties from different localities.

29. Iron hydroxide / 6 varieties from different localities.

30. Iron oxide / 3 varieties from different localities.

31. Iron sulfate / 1 variety from different localities.

13. Genus Aluminum

32. Tourmaline / 1 variety from different localities.

33. Topaz / 1 variety from different localities.

34. Garnet / 3 varieties from different localities.

35. Zeolite / 1 variety from different localities.

36. Mica / 6 varieties from different localities.

37. Chlorite / 3 varieties from different localities.

38. Feldspar / 4 varieties from different localities.

39. Opal / 5 varieties from different localities.

40. Chrysoberyl / 6 varieties from different localities.

41. Pyrophyllite, Talc / 4 varieties from different localities.

14. Genus Magnesium

42. Amphibole / 2 varieties from different localities.

43. Actinolite / 4 varieties from different localities.

44. Asbest / 2 varieties from different localities.

45. Serpentine / 2 varieties from different localities.

46. Magnesite / 1 variety from different localities.

15. Genus Calcium

47. Calcium sulfate / 8 varieties from different localities.

48. Fluorite / 2 varieties from different localities.

49. Calcium carbonate

50. Calcareous sinter / 9 varieties from different localities.

Obsidian / 5 varieties from different localities.

Pearly obsidian / 1 variety from different localities.

Pumice / 6 varieties from different localities.

Lava scoria / 1 variety from different localities.

Clay / 1 variety from different localities.

Coal / 5 varieties from different localities.

Succinite / 1 variety from different localities.

Schlegel classified mineral specimens into 15 genera, all of which were arranged according to their main chemical composition. His system of classification, however, was far from standard at the time. He separated obsidian, pumice, lava (scoria), clay, coal, and amber. His experience with others may have helped him to understand that these materials were not rocks and not minerals. The total number of specimens is unknown because Schlegel did not report such. Schlegel described only 227 different localities.ç We compared the classification of Schlegel with the classification of Bürger in terms of the standard used during that time period. Investigations on the labels written by Bürger indicates that he adopted the classification system of Abraham Gottlob Werner (1750-1817), a famous German mineralogist and professor of Mineralogy at Bergakademie Freiberg (Tagai

and Mikouchi, 2008). Though Bürger adopted the classification system of Werner, he used French names due to the French system of René-Just Hauÿ, such as ‘Grauspiesglanzerz, W. (Werner) Antimonie sulfuré, H. (Hauÿ). This writing style was standard for describing minerals in Europe at the time. We suspect that Bürger used Werner’s system because he was German.

Werner’s system of mineralogy was later translated into English by Robert Jameson (1774-1854), a professor of mineralogy at the University of Edinburgh. Jameson published the book “System of Mineralogy: Comprehending oryctognosy, geognosy, mineralogical chemistry, mineralogical geography and economical mineralogy” in 1804. He classified all minerals into three classes, which were subdivided into genera, genera into families, and each family into species, as follows:

Class I. Earthy Fossils

1. Diamond Genus
2. Zircon Genus
3. Flint Genus
    - Garnet Family
    - Ruby Family
    - Schorl Family
    - Quartz Family
    - Zeolite Family
    - Clay Family
4. Clay Genus
    - Slate Family
    - Mica Family
    - Frap Family
    - Lithomarge Family
5. Talc Genus
    - Scapsione Family
    - Talc Family
    - AEtynolite Family

6. Calc Genus
7. Baryte Genus
8. Strontiane Genus

Class II. Fossil Salts

Class III. Inflammable Fossils

1. Sulphur Genus
2. Bituminous Genus

Class IV. Metallic Fossils

1. Platina Genus
2. Gold Genus
3. Quicksilver Genus
4. Silver Genus
5. Copper Genus
6. Iron Genus
7. Lead Genus
8. Tin Genus
9. Bismuth Genus
10. Zinc Genus
11. Antimony Genus
12. Cobalt Genus
13. Nickel Genus
14. Manganese Genus
15. Molybdane Genus
16. Arsenic Genus
17. Scheele Genus
18. Menac Genus
19. Uran Genus
20. Sylvan Genus

Jameson published the second edition of the first volume in 1816 and the second and third vol-

umes of the third edition in 1820. In the first volume of the second edition (1816), he adopted a new classification system of Class - Family - Species - (Subspecies), but in the second and third volumes (1820), the system was changed again to Class - Order - Genus - Species - Subspecies, as follows:

- 1816 -

Class I. Earthy Minerals

1. Diamond Family
2. Zircon Family
3. Ruby Family
4. Schorl Family
5. Garnet Family
6. Quartz Family
7. Pitchstone Family
8. Zeolite Family
9. Azurestone Family
10. Feldspar Family
11. Clay Family
12. Clay-Slate Family
13. Mica Family
14. Lithomarge Family
15. Soapstone Family
16. Talc Family

-1820-

Class I. Earthy Minerals, continued

Order II. Spar

Genus V. Feldspar

Genus VI. Spodumene

Genus VII. Kyanite

Genus VIII. Augite

(Appendix)

Clay Family

Lithomarge Family

Genus IX. Schiller-Spar

Order III. Mica

Genus I. Copper Mica

Genus II. Uranite (Uran Mica)

Genus III. Red Cobalt (Cobalt Mica)

Genus IV. White Antimony (Antimony Mica)

Genus V. Blue Iron

Genus VI. Graphite

Genus VII. Mica

(Appendix)

Native Magnesia

Magnesite

Meerschaum

Nephrite

Serpentine

Fullers Earth

Order IV. Malachite

Genus I. Copper Green

Genus II. Malachite

Genus III. Olivenite

Genus IV. Emerald-Copper

Order V. Kerate

Genus I. Corneous Silver

Genus II. Corneous Mercury

Order VI. Baryte

Genus I. Lead-Spar

Genus II. Baryte

Genus III. Tungsten (Scheelium)

Genus IV. Calamine

Genus V. Red Manganese

Genus VI. Sparry Iron

Order VII. Haloide

Genus I. Limestone

Genus II. Apatite

Genus III. Fluor

Genus IV. Alum-Stone

Genus V. Cryolite

Genus VI. Gypsum

Class II. Saline Minerals

Order I. Fossil Salts

Genus I. Rock-Salt

Genus II. Sal Ammoniac

Genus III. Vitriol

Genus IV. Epsom-Salt

Genus V. Alum

Genus VI. Glauber-Salt

Genus VII. Nitre

Genus VIII. Natron (Soda)

Genus IX. Borax

Class III. Metalliferous Minerals

Order I. Native Metals

Genus I. Platina

Genus II. Gold

Genus III. Silver

Genus IV. Mercury

Genus V. Copper

Genus VI. Iron

Genus VII. Arsenic

Genus VIII. Bismuth

Genus IX. Antimony

Genus X. Tellurium

Order II. Ore

Genus I. Titanium Ore

Genus II. Red Copper-Ore

Genus III. Tin-Ore

Genus IV. Wolfram

Genus V. Tantalum-Ore

Genus VI. Uranium-Ore

Genus VII. Cerium-Ore

Genus VIII. Chrome-Ore

Genus IX. Iron-Ore

Genus X. Manganese-Ore

Order VI. Sulphur

Genus I. Sulphur

Class IV. Inflammable Minerals

Order I. Resin

Genus I. Honeystone

Genus II. Mineral Resin

Order II. Coal

Genus I. Coal

In the Jameson's "System of Mineralogy," the description of each species included references, external characters, chemical characters, physical characters, chemical parts, geognostic situation, geographic situation, use, and observations. Chemical compositions were given under 'chemical parts', as one of the results of chemical analysis. Historically, a lot of elements became detectable at

that time except light elements. We assume that it was about the period when minerals began to be classified based on chemical composition. For example, Jameson's system represents that chemical composition was adopted in order to classify minerals, but there were some obscurities because of insufficient chemical analysis techniques. We give an example of "Schorl Family" [from 1816 version] as follows:

Schorl Family contained the following species : topaz, schorlite (used as schorl, black tourmaline), pyrophysalite (used as muscovite, pseudomorph after topaz), euclase, emerald, iolite (used as cordierite), schorl, epidote, zoisite and axinite.

Bürger classified mineral specimens into four Classes (Klasse), and each Class was subdivided into Group (Geschlecht) in his manuscript, which we intend to publish in book format entitled 'De Mineralogia Japonica' , as follows:

I. Klasse Erdige Fossilien (Earthy Fossils)
    Kieselgeschlecht (Siliceous Group)
    Ton: Geschlecht. (Clay Group)
    Kalk:Geschlecht (Lime Group)
    Baryt:Geschlecht (Heavy Specimensar Group)
II. Klasse Salzige Fossilien (Salty Fossils)
III. Klasse Brennliche Fossilien (Combustible Fossils)
    Schwefel:Geschlecht (Sulphur Group)
    Erdharz:Geschlecht. (Bitumen Group)
    Resin:Geschlecht (Resin Group)
IV. Klasse. Metallische Fossilien (Metallic Fossils)
    Gold:geschlecht (Gold Group)
    Quecksilber:Geschlecht (Quick Silver Group)
    Silber:Geschlecht (Silver Group)
    Kupfer:Geschlecht. (Copper Group)
    Eisen:Geschlecht (Iron Group)
    Blei:Geschlecht (Lead Group)

Zinn:Geschlecht (Tin Group)

Wismut:Geschlecht (Bismuth Group)

Zink:Geschlecht (Zinc Group)

Antimon:Geschlecht (Antimony Group)

Mangan:Geschlecht (Manganese Group)

Kobold:Geschlecht (Cobalt Group)

Arsenik:Geschlecht (Arsenic Group)

The classification system of Bürger is observed to be closely related to the first edition by Jameson and that is more systematic than Schlegel's classification. The Bürger's list did not include several kinds of "Geschlecht" ("Genus" in Jameson) because he could not collect mineral specimens necessary for the complete list. We assume that this may be one of the reasons why Siebold and Bürger did not publish 'De Mineralogia Japonica'.