

2nd CO world Plenary Meeting

Dates: July 31th – August 2nd

Venue: Workation Hakuba (<https://www.mominokihotel.com/jp/green/resortwork/index.html>)

(会議前後の議論促進のために会場である白馬縦の木ホテルへの宿泊を推奨しますが、満室の場合は近隣のホテルをご検討ください)

Charges for Dinner (Day 1) and Lunch (Day 2 & 3): 6000 and 1500 yen, respectively
(9000 yen in total will be collected at the registration)

Access : <https://www.mominokihotel.com/jp/green/access/index.html>

Program :

Day 1 (7/31)

- 12:30- Registration
- 13:00-13:05 Introductory Remarks (Suzuki & Kitadai)
- 13:05-13:50 Introduction of the CO world project (Ozaki, Ueno, Kitadai & Suzuki)
- 13:50-14:00 Break

14:00-15:20 Session 1. Habitability & Biosignature

- 14:00-14:20 Keiko Hamano, Oxygen fugacity in a magma ocean as a function of metal-silicate equilibration conditions (溶融鉄・ケイ酸塩メルト間の元素分配条件とマグマオーシャンの酸化還元状態)
- 14:20-14:40 Yasuto Watanabe, Conditions for the onset of the CO runaway atmosphere and its impact on atmospheric chemistry (CO 暴走大気の発生条件と大気化学に及ぼす影響)
- 14:40-15:00 Yui Kawashima, Observability of CO worlds (CO ワールドの観測可能性)
- 15:00-15:20 Alexis Gilbert, Isotopic biomarkers as records of a CO world
- 15:20-15:40 Break

15:40-17:00 Session 2. Formation of the CO world (CO 大気と CO world の形成条件)

- 15:40-16:00 Yoshiaki Endo, CO partial pressures in Earth-like planet atmospheres: CO runaway linked to volcanic activity and distance from the star (地球型惑星大気の CO 分圧: 火成活動と恒星からの距離と CO 暴走)
- 16:00-16:20 Tatsuya Yoshida, Evolution of a CO-rich atmosphere and production of H₂CO on early Mars
- 16:20-16:40 Tetsuo Taki, Climate modeling and database for CO World (CO ワールド気候のモデルとデータベース構築)
- 16:40-17:00 Yuichiro Ueno, From CO to organics
- 17:00-17:20 Break
- 17:20-18:00 Discussion : How did CO world/atmosphere form?

19:00-21:00 Dinner (at Workation Hakuba)

Day 2 (8/1)

9:00-10:20 Session 3. Theoretical modeling of ecosystem (生態系のモデル化)

- 9:00-9:20 Kazumi Ozaki, How should CO metabolisms be incorporated into ecosystem model?
- 9:20-9:40 Mayumi Seto, Thermodynamic effects on microbial evolution and community structure (熱力学性質が微生物進化と群集構造に及ぼす影響)
- 9:40-10:20 Eric Smith, Mathematical work in the Chemistry group: Stoichiometry at multiple levels, and its consequences

10:20-10:40 Break

10:40-12:02 Session 4. Physiology of CO metabolism

- 10:40-10:42 Shino Suzuki, Introduction of Session 4.
- 10:42-11:02 Souichiro Kato, CO metabolisms in model species of acetogenic bacteria (酢酸生成菌モデル株のCO代謝)
- 11:02-11:22 Sanae Sakai & Shun'ichi Ishii, CO metabolism of sulfate-reducing archaea, and attempts at cultivation of CO-utilizing microbes from deep sea
- 11:22-11:42 Yuto Fukuyama, ^{13}C をトレーサーとした嫌氣的 CO 利用能の解明
- 11:42-12:02 Yoko Chiba, Suggestion and exportation of unknown CO-resistance mechanism (CO に対する未知耐性機構の示唆と探索)

12:00-13:00 Lunch

13:00-16:00 Table Discussion

Table 1. How to simulate the primordial CO ecosystem (初期 CO 生態系はどうモデル化すべきか?) (Leader: Seto & Ozaki)

(Poster 1) Mayumi Seto, Predictive modeling and challenges of chemotrophic microorganisms (化学合成微生物の動態予測と課題)

Table 2. Developments of photochemical chamber and atmospheric model (光化学チャンパーと大気光化学モデルの開発と応用) (Leader: Sebastian)

(Poster 2) Sebastian Danielache, Model development of formaldehyde formation under reducing conditions (還元条件下におけるホルムアルデヒド生成のモデル開発)

(Poster 2) Tran Thi Ngoc Trieu, Model study of chamber photochemical experiments of SO_2 Sulfur Mass-Independent Fractionation under reducing conditions (還元条件下における SO_2 硫黄質量非依存性分画のチャンパー光化学実験のモデル研究)

(Poster 2) Hideo Sagawa, Observations of CO isotopologues in Venus atmosphere (金星大気における CO 同位体比の観測的研究)

Table 3. Factors controlling the atmospheric CO concentration and CO-derived organic synthesis (CO 大気レベルと有機物生成を決める要因) (Leader: Endo)

(Poster 3) Tetsuo Taki, Development of CO World Climate Model (CO ワールド気候モデルの開発)

Table 4. Acetogen PSIA project (Leader: Suzuki & Gilbert)

(Poster 4) Yuta Sato, Y. Ueno, S. Suzuki, S. Kato, A. Gilbert, Intramolecular isotopic distribution in acetate produced from CO by Acetogen and Methanogen

(Poster 4) Kimiho Omae, How can CO be utilized as an energy source?

(Poster 4) Mio Matsumoto, Metagenomic Analysis of Hakuba Happo hot spring?

Table 5. How to demonstrate protometabolism, not only prebiotic chemistry (Leader: Ueno & Nakamura)

(Poster 5) Yuta Asakura, Xiaofeng Zang, & Ueno, UV synthesis of amino acids from CO

(Poster 5) Tomoharu Suda, Topics on the stability of chemical reactions

(Poster 5) Nishiki Tomizawa, Heterolytic N–N bond formation assisted by copper sulfide mineral toward nonenzymatic uracil synthesis

(Poster 5) Yang Zening, Unexpected reactivity of glycine: anaerobic oxidation to cyanide and its implications to life's emergence and extraterrestrial detection

(Poster 5) Akira Tanemura, Reproduction of electrochemical evolution by sulfide minerals in the flow-reactor simulating ancient deep-sea hydrothermal system

16:00-16:20 Wrap-up

16:20-16:40 Break

16:40-18:00 Session 5. Chemical routes of metabolism

16:40-17:00 Takashi Fujishiro, Challenges for molecular design of Fe-S enzymes functioning as an artificial Ni,Fe-CO dehydrogenase

17:00-17:20 Tomohiro Watanabe, Exploration of an electron-bifurcating CO-producing protein megacomplex (電子分岐反応で CO を合成するタンパク質超複合体の探索)

17:20-17:40 Masahiro Yamamoto, Sulfide rocks, electricity, and elemental sulfur as the electron sources in deep-sea hydrothermal fields

17:40-18:00 Ryuhei Nakamura, 蛇紋岩化が作り出すナノ空間と原始エネルギー代謝

18:00-20:00 Free time

20:00-22:00 Night Session 夜間集会

Day 3 (8/2)

9:00-10:20 Session 6. Diversity & Evolution of CO metabolism

- 9:00-9:20 Shino Suzuki, CO metabolisms in serpentinized ecosystems and report of field works
- 9:20-9:40 Kimiho Omae, CO デヒドロゲナーゼ遺伝子クラスターの多様性解析
- 9:40-10:00 Shun'ichi Ishii, 環境マイクロバイームからの CO 資化菌と CO 分解酵素の探索
- 10:00-10:20 Yoshihiro Shimizu & Kazuaki Amikura, 無細胞系における酸化還元反応の確立
- 10:20-10:40 Break
- 10:40-12:00 Session 7. Protometabolism**
- 10:40-11:00 Norio Kitadai, Sustained electricity generation through H₂-driven FeS₂/FeS redox cycle
- 11:00-11:20 Yamei Li, Unique reactivity of glycine at ambient temperature: implications to life's emergence and its extraterrestrial detection
- 11:20-11:40 Kensuke Igarashi, Analysis of organic synthesis from CO in the presence of light, heat, and mineral catalysts
- 11:40-12:00 Jun Yoshinobu, Spectroscopic studies of adsorption and reaction of small molecules on transition metal sulphide surfaces
- 12:00-13:00 Lunch
- 13:00-14:50 Discussion : Planetary environment suitable for the emergence of life (生命を生み出す惑星環境とは?)
- 15:00 End of meeting