New insights into the Cambrian explosion based on exceptionally preserved fossils

My research goals focus on understanding the early evolution of two important invertebrate clades: arthropods and echinoderms, and the origination and sustainability of marine benthic communities through time. By understanding the taphonomic aspects, including necrolysis, entombment processes, and fossil-diagenesis, we can understand how those exceptionally preserved organisms once lived, died, and were buried in the fossil record. For example, the unique aspect of the Cambrian-Precambrian transition is that most of the modern phyla have evolved or can be traced to that critical time and most of modern animal classes are fully established by the Ordovician. Thus, we can test known hypotheses on evolutionary ecology based on the new information we gathered around the beginning of the fossil record. One idea is that the dynamic interactions among principle ecologic members were already existed among Cambrian deposits of exceptional preservation based on my work on Kaili Biota (see Lin 2008; ISBN: 9783639101089). On the other hand, bioturbation-induced effects were thought to be a major factor causing the rapid disappearance of BST deposits during the Cambrian-Ordovician transition. However, there is growing evidence indicating the presence of trace fossils in Burgess Shale-type (BST) deposits worldwide. Based on the observed effects of bioturbation on the preservation of five different animal groups, including eldoniids, echinoderms, trilobites, monoplacophorans, and non-biomineralizing arthropods, it is clear that infaunal scavengers/deposit feeders were periodically active on the Cambrian sea floor exemplified by Kaili substrates and were able to reach historic layers yielding exceptionally preserved fossils.

我的研究目標主要著重於研究節肢和棘皮動物的早期演化及海洋底棲生物群落的起源和永續性。由於對埋藏過程中各個主要階段的認識，我們可以瞭解更多有關這些保存精美遠古生物的生態、死亡歷史和化石化過程。舉例來說，前寒武紀-寒武紀的過度時期是早期生命演化的重要視窗，現生生物門類到奧陶紀就已全部出現。因此，我們可以利用有關早期化石記錄新的資訊來測試前人提出來演化生態學方面的假說。其中，根據個人研究，幾個重要無脊椎骨動物門類的屬種與屬種之間已有很密切地互動關係。另外，伯捷斯頁岩型特異埋藏生物群在寒武紀之後的大量消失一直是一個未解的科學謎題。在眾多的假說當中，潛居生物的崛起造成後期生物擾動頻繁導致伯捷斯頁岩型生物群在寒武紀之後大量消失是被大部學者認同的一個解釋。但是，我們的研究團隊卻提出了有力證據來推翻此假說。

我的研究目标主要着重于研究节肢和棘皮动物的早期演化及海洋底栖生物群落的起源和永续性。由于对埋藏过程中各个主要阶段的认识，我们可以了解更多有关这些保存精美远古生物的生态、死亡历史和化石化过程。举例来说，前寒武纪-寒武纪的过度时期是早期生命演化的重要窗口，现生生物门类到奥陶纪就已全部出现。因此，我们可以利用有关早期化石记录新的信息来测试前人提出来演化生态学方面的假说。其中，根据个人研究，几个重要无脊椎骨动物门类的属种与属种之间已有很密切地互动关系。另外，布尔吉斯页岩型特异埋藏生物群在寒武纪之后的大量消失一直是一个未解的科学谜题。在众多的假说当中，潜居生物的崛起造成后期生物扰动频繁导致布尔吉斯页岩型生物群在寒武纪之后大量消失是被大部学者认同的一个解释。但是，我们的研究团队却提出了有力证据来推翻此假说。

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