

# METADATA STANDARDS

A well established metadata schema can become a standard.

**Researchers, librarians and web technologists drafted the Dublin Core** – a set of library-card-catalog-like metadata elements for the web – in 1995 at a meeting in Dublin, Ohio (USA). [1]

**Creator**  
**Contributor**  
**Publisher**  
**Title**  
**Date**  
**Language**  
**Format**  
**Subject**  
**Description**  
**Identifier**  
**Relation**  
**Source**  
**Type**  
**Coverage**  
**Rights**

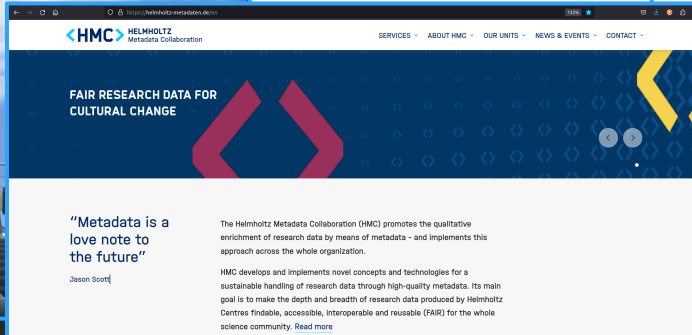
[1] <https://www.dublincore.org/resources/metadata-basics/>

[2] <https://www.dublincore.org/specifications/dublin-core/dcmi-terms/#section-3>

[3] <https://www.dublincore.org/about/>

[4] <https://www.iso.org/standard/71339.html>

Colossus Front Row Seat on-ride HD POV Thorpe Park



## Sulfate Metabolism in *C. Flaveria* Species Is Controlled by the Root and Connected to Serine Biosynthesis<sup>11OPEN</sup>

ke C. Gerlich,<sup>1\*</sup> Berkley J. Walker,<sup>2</sup> Stephan Krueger,<sup>2</sup> and Stanislav Kopriva<sup>1,2,3</sup>  
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<sup>2</sup>Cluster of Excellence on Plant Sciences, University of Cologne, 50674 Cologne, Germany  
<sup>3</sup>Institute of Plant Biochemistry, Cluster of Excellence on Plant Sciences, Heinrich Heine University Düsseldorf, 25 Düsseldorf, Germany  
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evolution of *C. photosynthesis* led to an increase in carbon assimilation rates and plant growth compared to *C. photosynthetic* plants. This enhanced plant growth, in turn, affects the requirement for soil-derived mineral nutrients. However, mineral nutrition has scarcely been considered in connection with *C. photosynthesis*. Sulfur is crucial for plant growth and development, and preliminary studies in the genus *Flaveria* suggested metabolic differences in sulfate assimilation along the *C. glutathione* (GSH) pathway. Here, we show that in controlled conditions, sulfur accumulation of the reduced sulfur compounds Cys glutathione (GSH) increased with progressing establishment of the *C. photosynthetic* cycle in different *Flaveria* species. An increased demand for reduced sulfur in *C. Flaveria* species is reflected in high rates of [<sup>35</sup>S]sulfate incorporation into GSH upon sulfate deprivation and increased GSH turnover as a reaction to the inhibition of GSH synthesis. Expression analyses indicate that the  $\gamma$ -glutamyl cycle is crucial for the recycling of GSH in *C. species*. Sulfate reduction and GSH synthesis seems to be preferentially localized in the roots of *C. species*, which might be linked to the co-localization with the phosphorylated pathway of biosynthesis. Interspecific grafting experiments of *F. robusta* (*C.*) and *F. hirsuta* (*C.*) revealed that the root system primarily controls sulfate acquisition, GSH synthesis, and sulfate and metabolite allocation in *C. and C. plants*. This study thus shows that future of *C. photosynthesis* resulted in a wide range of adaptations of sulfur metabolism and points out the need for broader focus on importance of mineral nutrition for *C. plants*.

sulfur (S) possesses a wide variety of essential functions for cell structure and metabolism. Incorporated in the amino acids Cys and Met, S is an important component of proteins. Cys is further a constituent of the tripeptide glutathione (GSH), which maintains cellular redox balance and is involved in detoxification and xenobiotic and heavy metal metabolism (Rouhier et al., 2008). Further component of prothetic group clusters, lipic acid, or coenzyme

Sulfate uptake and distribution within the organism is facilitated by sulfate transporters. For assimilation, the inert and stable sulfate is activated by ATP sulfurylase (ATPS) by transferring it onto an  $\alpha$ -phosphate residue of ATP and yielding in adenosine-5'-phospho-

```

31 #####
32 ##### CREATE
33 #####
34
35 pathDict = {a:
36
37 ### assign template path for specific "Course Title"
38 if pathDict.get("Course Title") == "Fundamentals of science"
39     pathDict.update({"Template Path" : "/local/home/s.gerlich/Fundamentals of science"})
40
41 ### UPDATE THIS PART IF NECESSARY ###
42 #elif pathDict.get("Course Title") == "Metadata for data science"
43 #    pathDict.update({"Template Path" : "another/File/Path"})
44 #elif pathDict.get("Course Title") == "Introduction to data science"
45 #    pathDict.update({"Template Path" : "yet another/File/Path"})
46
47 pathDict = {key:
48
49 ### convert course title to path
50 pathJsonOut = json.dumps(pathDict)
51
52 ### save metadata file
53 jsonFile = open("pathDict.json", "w")
54 jsonFile.write(pathJsonOut)
  
```

```

"abstract": "The data describes the biomechanical",
"format": "text/csv",
"date": "2022-02-28",
"creator": [
    {
        "creatorName": "Bruce Wayne",
        "creatorAffiliation": "Institute for Vigilance",
        "experimentalParameters": {
            "testRide": {
                "sex": "male",
                "location": "Gotham City, New Jersey",
                "rideType": "roller coaster"
            },
            "testPerson": {
                "sex": "male",
                "height": 180
            },
            "recording": {
                "testDevice": "iPhone X",
                "testDeviceFixture": "left upper arm",
                "testApp": "Physics Toolbox Suite by Vievra Software"
            }
        }
    }
  ]
  
```



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Connecting research and researchers

**https://orcid.org/0000-0003-3043-5657**

**Keywords**  
Plant Science, Research Data Management, Data Science, Molecular Biology, Metadata

**Countries**  
Germany

to this you? Sign in to start

**Silke Christine Gerlich**

**Activities**  
- Employment (3)

**Forschungszentrum Jülich GmbH: Jülich, Nordrhein-Westfalen, DE**  
2021-06-01 to present | Post Doc (IAS-9 / Helmholtz Metadata Collaboration (HMC))  
Employment  
Source: Silke Christine Gerlich

**StudienStiftung des deutschen Volkes eV: Bonn, Nordrhein-Westfalen, DE**  
2018-01-01 to 2018-09-30 | Coordinator  
Employment  
Source: Silke Christine Gerlich

**Universität zu Köln: Köln, Nordrhein-Westfalen, DE**  
2015-01-01 to 2018-12-31 | PhD student (Botanical Institute)  
Employment  
Source: Silke Christine Gerlich



**Dublin Core** and its extensions are widely used and referenced today. The Dublin Core Metadata Initiative (DCMI) states to work openly, with a paid-membership model. [3] The 15 Dublin Core metadata elements have been formally standardized for cross-domain resource description as e. g. **ISO 15836-1:2017**. [4]

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**Coverage**  
**Rights**

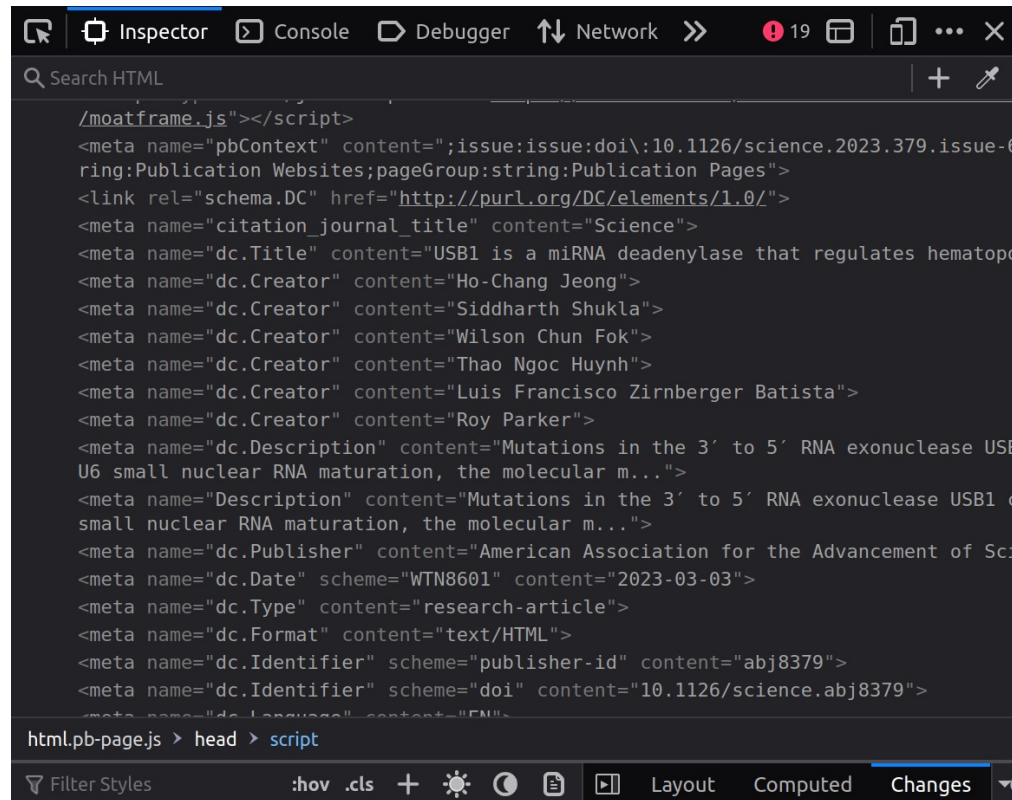
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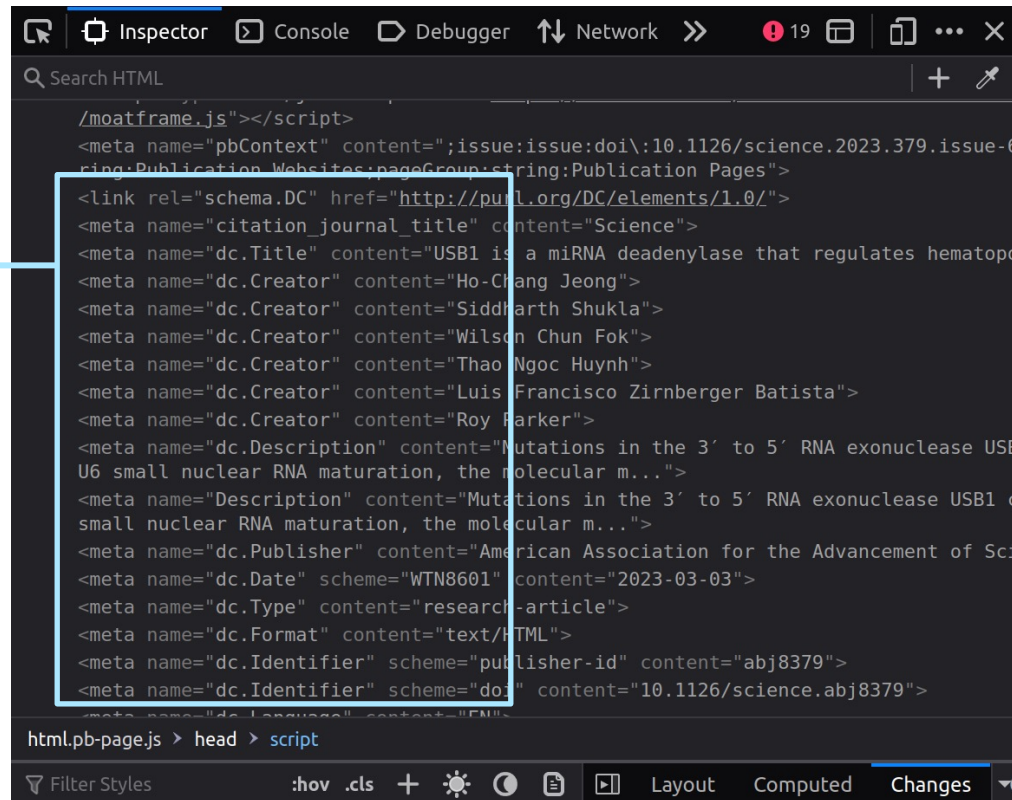
<https://www.science.org/>



```
Inspector Console Debugger Network >> 19
Search HTML
+
/moatframe.js"></script>
<meta name="pbContext" content=";issue:issue:doi\10.1126/science.2023.379.issue-6
ring:Publication Websites;pageGroup:string:Publication Pages">
<link rel="schema.DC" href="http://purl.org/DC/elements/1.0/">
<meta name="citation_journal_title" content="Science">
<meta name="dc.Title" content="USB1 is a miRNA deadenylase that regulates hematopo
<meta name="dc.Creator" content="Ho-Chang Jeong">
<meta name="dc.Creator" content="Siddharth Shukla">
<meta name="dc.Creator" content="Wilson Chun Fok">
<meta name="dc.Creator" content="Thao Ngoc Huynh">
<meta name="dc.Creator" content="Luis Francisco Zirnberger Batista">
<meta name="dc.Creator" content="Roy Parker">
<meta name="dc.Description" content="Mutations in the 3' to 5' RNA exonuclease USB
U6 small nuclear RNA maturation, the molecular m...">
<meta name="Description" content="Mutations in the 3' to 5' RNA exonuclease USB1 c
small nuclear RNA maturation, the molecular m...">
<meta name="dc.Publisher" content="American Association for the Advancement of Sci
<meta name="dc.Date" scheme="WTN8601" content="2023-03-03">
<meta name="dc.Type" content="research-article">
<meta name="dc.Format" content="text/HTML">
<meta name="dc.Identifier" scheme="publisher-id" content="abj8379">
<meta name="dc.Identifier" scheme="doi" content="10.1126/science.abj8379">
<meta name="dc.Language" content="English">
html.pb-page.js > head > script
Filter Styles :hov .cls + [Icons] Layout Computed Changes
```

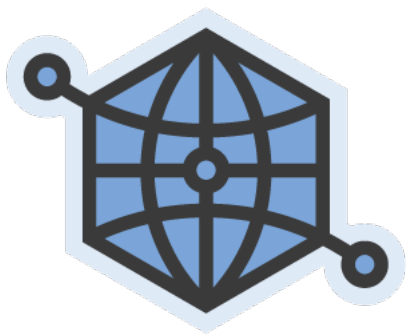
<https://www.science.org/>

## Dublin Core Elements



```

</script>
<meta name="pbContext" content=";issue:issue:doi\10.1126/science.2023.379.issue-6
ring:Publication_Websites:pageGroup:string:Publication Pages">
<link rel="schema.DC" href="http://purl.org/DC/elements/1.0/">
<meta name="citation_journal_title" content="Science">
<meta name="dc.Title" content="USB1 is a miRNA deadenylase that regulates hematopo
<meta name="dc.Creator" content="Ho-Chang Jeong">
<meta name="dc.Creator" content="Siddharth Shukla">
<meta name="dc.Creator" content="Wilson Chun Fok">
<meta name="dc.Creator" content="Thao Ngoc Huynh">
<meta name="dc.Creator" content="Luis Francisco Zirnberger Batista">
<meta name="dc.Creator" content="Roy Parker">
<meta name="dc.Description" content="Mutations in the 3' to 5' RNA exonuclease USB
U6 small nuclear RNA maturation, the molecular m...">
<meta name="Description" content="Mutations in the 3' to 5' RNA exonuclease USB1 c
small nuclear RNA maturation, the molecular m...">
<meta name="dc.Publisher" content="American Association for the Advancement of Sci
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<meta name="dc.Type" content="research-article">
<meta name="dc.Format" content="text/html">
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<meta name="dc.Identifier" scheme="doi" content="10.1126/science.abj8379">
<meta name="dc.Language" content="English">
</html>
html.pb-page.js > head > script
Filter Styles :hov .cls + [Icons] Layout Computed Changes
```



Open Graph Protocol

**schema.org**

<https://www.theguardian.com>

A screenshot of a web browser's developer tools, specifically the 'Inspector' tab. The search bar at the top contains 'Search HTML'. The main area displays the HTML code of a page. A blue box highlights the following meta tags:

```
<meta property="og:image:width" content="1200">
<meta property="og:image" content="https://i.guim.co.uk/img/media/1d3542de00b22bab
<meta property="at:ios:url" content="gimguardian://world/2023/mar/05/greek-pm-sorr
<meta property="article:publisher" content="https://www.facebook.com/theguardian">
<meta property="og:title" content="Greek PM 'sorry' over train crash that killed d
<meta property="fb:app_id" content="180444840287">
<meta property="article:modified_time" content="2023-03-05T15:54:53.000Z">
<meta property="og:image:height" content="720">
<meta property="og:description" content="Parlous state of rail system in spotlight
<meta property="og:type" content="article">
<meta property="al:ios:app_store_id" content="409128287">
<meta property="article:section" content="World news">
<meta property="article:published_time" content="2023-03-05T15:53:52.000Z">
<meta property="article:tag" content="Greece,Rail transport,Europe,World news">
<meta property="al:ios:app_name" content="The Guardian">
<meta property="og:site_name" content="the Guardian">
```

The bottom of the screenshot shows the breadcrumb 'html > body'.