

F. Christian THOMPSON (1944–2021): his influence and legacy to Neotropical dipterology

[F. Christian THOMPSON (1944–2021): Sein Einfluss und sein Vermächtnis in Hinblick auf die Dipterologie der Neotropis]

Ximo MENGUAL

Bonn, Germany

Abstract

The most influential publications of F. Christian THOMPSON on Neotropical Syrphidae are discussed, including his invaluable synthetic work to propose new broader generic concepts for Neotropical taxa. I also provide some insights into his character and some of my personal experiences with him.

Keywords: Diptera, Syrphidae, flower flies, hover flies, taxonomy, Neotropical Region, Neotropics, personal reflections

Zusammenfassung

Die einflussreichsten Veröffentlichungen von F. Christian THOMPSON über neotropische Schwebfliegen werden einschließlich seiner unschätzbaren synthetischen Arbeit diskutiert. Sie fokussierten auch darauf, neue und breitere generische Konzepte für neotropische Taxa vorzuschlagen. Es werden auch ganz persönliche Einblicke in sein Wesen und Erfahrungen mit Chris THOMPSON mitgeteilt.

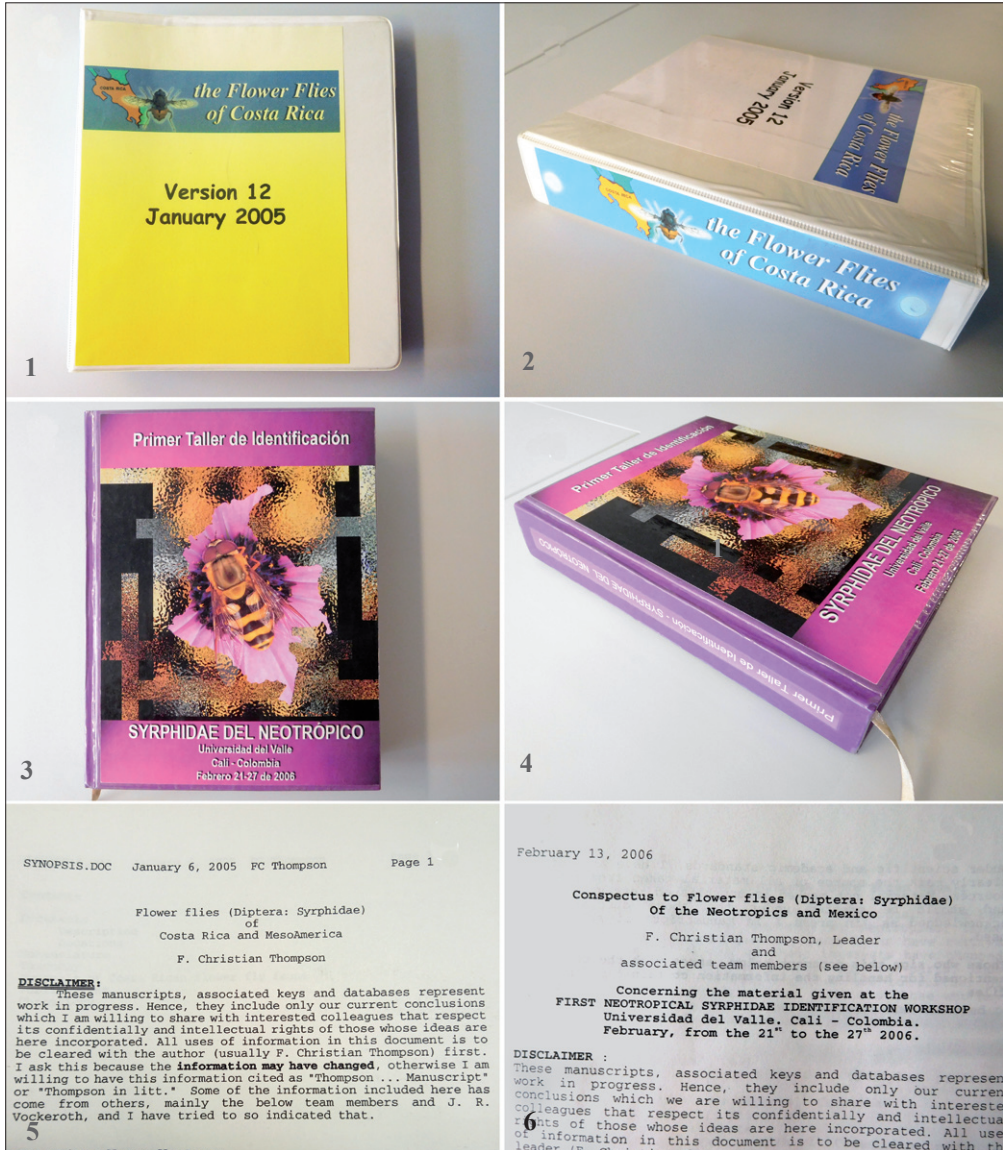
Stichwörter: Diptera, Syrphidae, Schwebfliegen, Taxonomie, neotropische Region, Neotropis, persönliche Erlebnisse

My beginnings with Chris

I first met F. Christian THOMPSON (Chris) back in 2003, during the II International Symposium on Syrphidae in Alicante (Spain). I was a recent graduate student, who helped to organize the symposium, and I was a bit shy to introduce myself to such a world-renowned researcher. That was never a problem for Chris, who liked to get to know the new students and their research, and we exchanged a few words during those days. I still vividly remember his closing talk and the shocked audience after one of his most memorable comments regarding professional and amateur dipterologists; he was the only professional syrphidologist in the symposium following his argument. Chris never held back on his opinions, and they were often very controversial.

Two years later, in January 2005, I met Chris again for a two-week field expedition in Costa Rica. This was not the first visit of Chris to this beautiful MesoAmerican country. In November 1991, almost paired with the creation of the INBio (Instituto Nacional de la Biodiversidad), Chris sent a commitment letter formalizing his intention to study the flower flies of Costa Rica. Since then, Chris visited Costa Rica on several occasions within the framework of the Costa Rican National Biodiversity Inventory. During his trips, Chris worked with Manuel ZUMBADO (INBio) and collaborated with Paul HANSON (Universidad de Costa Rica) and Dan JANZEN (University of Pennsylvania and Area de Conservación Guanacaste) to ac-

cumulate a vast knowledge of the syrphid fauna of MesoAmerica. In our joint trip of 2005, we spent our days while in San José at the Instituto Nacional de Biodiversidad (INBio) preparing for field work in several areas along the west coast of the country. In the first day, Chris gave us a copy of his “Flower flies of Costa Rica and MesoAmerica” (Figs 1, 2, 5), a compendium of manuscript identification keys, conspectuses and gathered information, including an early



Figs 1–6: Manuscript material provided by F. Christian THOMPSON for the taxonomical identification of Neotropical Syrphidae. – 1, 2: Folder of his “Flower flies of Costa Rica and MesoAmerica”, version 12 from January 2005; – 3, 4: Bound volume for the “Primer taller de identificación de Syrphidae (Diptera) del Neotrópico”, regularly cited as THOMPSON (2006); – 5: First page of the “Flower flies of Costa Rica and MesoAmerica”, version 12; – 6: First page of the volume “Primer taller de identificación de Syrphidae (Diptera) del Neotrópico”.

version of the chapter dedicated to Syrphidae for the *Manual of Central American Diptera*, finally published a few years later (THOMPSON et al. 2010). In the field, I never saw such a selective collector before – Chris knew the genus and most of the species before having them in his net – and he was definitively faster than us (a group of five, with the oldest member more than 20 years younger than Chris) walking through the cloud forest. One morning in the Cerro de la Muerte, over 3000 m a.s.l., he saw a robust female of what could be a new species of *Mallota* MEIGEN, and the whole team spent a couple of hours in that area of 50 square meters trying to catch that female flower fly. We never did.

During the fall of 2005 I spent two weeks visiting Chris at the National Museum of Natural History (NMNH), Washington, D.C. It was a very helpful stay to work on material collected during 2004 in Madagascar and on our joint expedition in Costa Rica. Those specimens would end up forming the largest part of my PhD, together with the sampled material from Colombia in 2006, again with Chris. During my 2005 visit, I brought to D.C. a couple of males of a new species of *Palpada* MACQUART to describe them together with Chris. The material was collected in 2004 on a hilltop close to Cali (Colombia) by my friend Carlos PRIETO (also a PhD candidate like me at that time). It was my first new species description and Chris's help was priceless; he not only taught me how to describe a species, but also the steps to follow in any description to agree with the International Code of Zoological Nomenclature. Chris wanted to study the collection of the Instituto de Investigación de Recursos Biológicos Alexander VON HUMBOLDT, housed at the time at the Universidad del Valle (Cali, Colombia), and we ended up visiting Colombia next year (2006) with a double goal: to collect more specimens of the new species (finally published in MENGUAL & THOMPSON 2008) and to take part in the “Primer taller de identificación de Syrphidae (Diptera) del Neotrópico” organized at the Universidad del Valle. Chris taught the taxonomy and systematics of Neotropical flower flies and shared all his manuscript identification keys for the genera occurring in South America; a kind of updated work from his “Flower flies of Costa Rica and MesoAmerica” from 2005. The organizers (Nancy CARREJO, Carlos RUIZ and Catalina GUTIERREZ) printed and nicely bound all the immense knowledge gathered by CHRIS for this event in a limited-edition volume, with fewer than 10 original copies remaining in existence (Figs 3, 4, 6). The printed manuscript work has been extensively used and cited as THOMPSON (2006) and THOMPSON *in litt.* by many authors including Chris himself (RESTREPO-ORTIZ & CARREJO 2009; MENGUAL et al. 2012, 2018; MORALES et al. 2014; MENGUAL & LÓPEZ GARCÍA 2015; THOMPSON & WYATT 2015; ARCAYA & MENGUAL 2016; MONTOYA 2016; SINCLAIR et al. 2016; ARCAYA SÁNCHEZ et al. 2017; MARÍN-ARMIJOS et al. 2017; MENGUAL 2017; THOMPSON 2017; MEDEIROS et al. 2019; ÁNGEL VILLARREAL et al. 2021).

The very positive teaching experience prompted Chris to repeat the identification course two years later in Peru (Figs 7, 8). The “II taller de identificación de Syrphidae (Diptera) del Neotrópico” was organized by the Universidad Nacional Agraria La Molina between June and July 2008, within the collaborative Spanish project AECID A/013484/07, but a very last-minute legal issue left Chris without the possibility to fly to Peru and immediately I became the teacher of the course. The course took place two weeks after my PhD defense, where Chris was the president of my evaluation committee, and the course went well despite the short preparation time I had. Once more, Chris's help was invaluable providing slides and information to prepare the classes and the field expedition. During the minutes following my PhD defense, Chris asked me to apply for a postdoc position funded by The SCHLINGER Foundation at the NMNH, and I happily moved to Washington, D.C. in January 2009. For two years we worked on the systematics of Syrphidae and, when I was running out of the funds generously provided by The SCHLINGER Foundation, Chris prompted me to become one of the

UNIVERSIDAD NACIONAL AGRARIA LA MOLINA
Facultad de Agronomía
BOGOTÁ DE ORO DE LA ESCUELA DE POSTGRADO

ESPECIALIDAD DE ENTOMOLOGÍA
ESPECIALIDAD DE MANEJO INTEGRADO DE PLAGAS

CURSO INTERNACIONAL:

Importancia y Biodiversidad de los Sírfidos Neotropicales

II TALLER DE IDENTIFICACIÓN DE SYRPHIDAE (DIPTERA) DEL NEOTRÓPICO
Del 30 de Junio al 2 de Julio de 2008

INFORMACIÓN E INSCRIPCIONES
Escuela de Postgrado
Telf. (511) 34-5647 / 349-5669 anexo 209
Fax. (511) 349-5678
e-mail: escuela@lamolina.edu.pe
Departamento Académico de Entomología
Telf. (511) 349-5647 anexo 328
e-mail: nathaly200227@hotmail.com

COSTO
TEORIA: USD \$ 50.00
(Incluye CD con un extracto de ponencias y separatas)
TEORIA Y PRACTICA: USD \$ 150.00
(Incluye manual para la identificación de Syrphidae Neotropicales, separatas y CD del curso).
Las prácticas se desarrollaran con material biológico proporcionado por la institución y los alumnos podrán traer sus propias muestras para identificación.
Depósito a la cuenta de la Fundación para el Desarrollo Agrario:
191-0-031059-0-26, Banco de Crédito del Perú
(Enviar por fax o correo electrónico el recibo del depósito respectivo)

Importancia y Biodiversidad de los Sírfidos Neotropicales

DURACIÓN: 3 DÍAS (30 horas lectivas)
PROGRAMA DEL CURSO
Lunes 30: Mañana-Tarde (teoría)
Martes 1: Mañana (teoría); tarde (práctica de Microdontinae, Syrphinae)
Miércoles 2: Mañana (teoría); tarde (práctica de identificación de Eristalinae)

EXPOSITORES

- Coordinación y dirección: Dr. F. Christian Thompson, investigador del Systematic Entomology Laboratory (Agricultural Research Service, USDA, Smithsonian Institution, Washington D.C., U.S.A.);
- Colaboradores: Dr. Santos Rojo, Dr. Ximo Mengual, Dra. Celeste Pérez-Bañón, Dra. Ana Isabel Martínez, Grupo de Investigación en Díptera, CIBIO, Universidad de Alicante, Alicante, España.

ORGANIZACIÓN DEL CURSO

- **Universidad Nacional Agraria La Molina:** Departamento Académico de Entomología; Museo de Entomología "Klaus Raven Büller" Escuela de Post Grado
- **Universidad de Alicante:** Instituto Universitario CIBIO (Centro Iberoamericano de la Biodiversidad)

Patrocinador AECID, Proyecto A/013484/07- Per 27

OBJETIVOS

- Presentar la historia evolutiva, sistemática, biodiversidad e importancia aplicada de la familia Syrphidae.
- Identificación de las especies y géneros presentes en Perú y otras regiones del Neotrópico mediante características morfológicas válidas.
- Datar a los participantes de las herramientas necesarias para la correcta identificación y estudio de sírfidos neotropicales.

CONTENIDO

- La Sistemática en la era digital: BioSystematic Database of World Diptera (BDWD).
- Generalidades sobre la taxonomía, diversidad y distribución de los Syrphidae.
- Morfología de imagos de la familia Syrphidae.
- Generalidades sobre la biología y morfología larval. Importancia en investigación aplicada.
 - Historia de la clasificación de la familia Syrphidae.
 - Técnicas de estudio, manejo, preparación y conservación de las especies de Syrphidae.
 - Identificación, estudio y biodiversidad de las subfamilias de Syrphidae (I): Microdontinae, Syrphinae y Eristalinae.
 - Identificación, estudio y biodiversidad de las subfamilias de Syrphidae (II): Eristalinae.

II TALLER DE IDENTIFICACIÓN DE SYRPHIDAE (DIPTERA) DEL NEOTRÓPICO

Figs 7, 8: Handbill/flyer advertising the “II taller de identificación de Syrphidae (Diptera) del Neotrópico”. – 7: Front and back cover; – 8: Interior.

first Encyclopedia of Life RUBENSTEIN Fellows (<https://Syrphidae.myspecies.info/>). During those six months as a RUBENSTEIN Fellow, I learned about Syrphidae taxonomy more than in all the previous years since I graduated, thanks to the enthusiasm and support from Chris.

Years later, I copied the same format of Chris's course to teach the "Curso Internacional Teórico Práctico de Taxonomía y Ecología de Insectos" organized by the Universidad Técnica Particular de Loja (Ecuador) in 2012. And even a third Neotropical syrphid identification workshop was planned in Venezuela, but it never took place due to reasons not related to science.

Neotropical Syrphidae

Since his first publication, the Neotropical flower flies (he always advocated against the term hover flies) remained one of his main research topics. His first work ever published was on a new Neotropical species of *Copestylum* MACQUART (THOMPSON 1965) and was followed by 53 other works where he treated, described and studied Neotropical taxa (see MENGUAL et al. 2023). My intention is not to review all his publications dealing with Neotropical taxa, but to emphasize what Chris's work on Neotropical Diptera meant for dipterology. Among his publications, there are several works considered as 'masterpieces' to understand the generic concepts that we currently use for Neotropical Syrphidae. The first (in chronological order) of these gems is his PhD work (THOMPSON 1972), where he revised the subfamily Eristalinae (as Milesiinae), inferred phylogenetic relationships for many tribes and generic groups, and discussed zoogeographical patterns and transitions between South and North American eristalines. In this influential publication, Chris already applied a methodology that would revolutionize the systematics and taxonomy of the New World syrphids: his tendency to arrange different taxa (placed under different names before his work) in larger units or genus concepts. In other words, he was a 'lumper' and not a 'splitter'. Those who knew Chris will remember that he used to divide taxonomists into these two groups, with a remarkable inclination to consider 'splitters' all his European colleagues and 'lumpers' most of the American taxonomists. During the following years, the 'lumping' exercise of Chris and his very good friend John Richard (Dick) VOCKEROTH made achievable what seemed impossible: to recognize and name the genus of every Neotropical syrphid species. This immense work of synthesis is exemplified in many of his taxonomic revisions, where taxa changed their status, and culminated in the chapter on Syrphidae for the *Catalogue of the Diptera of the Americas South of the United States* (THOMPSON et al. 1976), the second of Chris's most significant publications on Neotropical flower flies.

In 1974, Chris was hired at the U.S. Department of Agriculture after a two-year fellowship at the American Museum of Natural History, and he came up with a three-year research plan to study the Neotropical syrphids (EVENHUIS 2021). The *Catalogue of the Diptera of the Americas South of the United States* (THOMPSON et al. 1976) was the fruit of this research plan. For each genus and each species, there is information on the type locality, type holding institution, type specimen(s) and geographical distribution. In the era before internet, this kind of publication was more valuable than gold for taxonomists. Among the numerous new combinations, new names (17 authored by Chris) and new synonyms, we find again the same synthesis effort at genus level exemplified in genera like *Allograpta* OSTEN SACKEN (three new synonyms, two brought out of synonymy later), *Arctophila* SCHINER (one), *Argentinomyia* LYNCH ARRIBÁLZAGA (two), *Criorhina* MEIGEN (one), *Leucopodella* HULL (one), *Meromacrus* RONDANI (one), *Microdon* RONDANI (one), *Ocyptamus* s. l. MACQUART (13, with only two kept in synonymy nowadays), *Paramicrodon* DE MEIJERE (one), *Pseudodoros* BECKER (one), and *Ubristes* WALKER (one). The application of broad taxonomic concepts for these

genera allowed a more exhaustive analysis of these taxa by other authors and helped to focus the taxonomic comparison on those species included in the new generic concept. Sometimes they did not get it right and mixed different taxa (e.g., in the case of the synonymy of *Aristosyrphus* CURRAN under *Argentinomyia*), but most of the resulting new generic concepts aggregated large evolutionary lineages under one name. These new genus concepts were tractable, had morphological diagnostic characters, and boosted the taxonomic research on Neotropical Syrphidae by facilitating the study of more manageable and recognizable systematic units.

The next monumental publication was devoted to the syrphid fauna of the West Indies (THOMPSON 1981). In my opinion, Chris had much affection for this publication and often presented it as a good example of a taxonomic revision. In addition to the identification keys, excellent drawings and extensive taxonomic work, the remarks written by Chris were a way of putting his hypotheses and ideas on paper, and he did not skimp on details. The Addendum (THOMPSON 1981: 191–196) contains extremely valuable information that usually would be part of the main text, including the description of a new species and an identification key to the species of *Leucopodella*, with up to five undescribed species. A few years ago, I took responsibility to finish the taxonomic revision of *Leucopodella*, which I am close to accomplishing now; finally, some of these taxa will be described four decades after their discovery. My apologies, Chris, for not being faster.

Another of Chris's publications I consider pivotal in the development of the systematics of Neotropical flower flies is "*A key to the genera of the flower flies ... of the Neotropical Region ...*" (THOMPSON 1999). In the key, Chris wrote the number of described and undescribed species (known to him) for each genus with a small note on distribution or likely mistakes, together with relevant literature. The work is full of nomenclatural acts (five new synonyms, two new combinations, nine new species and two new genera) and includes the only published key to all the Neotropical syrphid genera. In the Introduction, Chris explained his personal way of making dichotomous keys, which I still follow, and he compiled a glossary of taxonomic terms that has become the standard terminology for most syrphid researchers in the last two decades. By compiling and unifying several earlier terminologies, this publication works as a dictionary for *old* and *new* taxonomic terms applied to Diptera, more specifically to Syrphidae. Last time we met in Washington, D.C., Chris was working on a new version of the glossary with additional terms.

Although it is not considered a publication but a manuscript work, his "Conspectus to Flower flies (Diptera: Syrphidae) of the Neotropics and Mexico" (THOMPSON 2006 or THOMPSON *in litt.*) deserves a special mention here (see comments on the previous section). So far, this is the only taxonomic compendium that covers the Neotropical fauna of flower flies in its totality.

The last masterpiece of Chris that deserves attention is the Syrphidae chapter in the *Manual of Central American Diptera* (THOMPSON et al. 2010). The chapter has information about the morphology, biology and systematics of the family Syrphidae and an identification key to the genera of the northern Neotropical Region, based on both adults and larvae. Besides including the most significant literature, the chapter ends with a small summary about each genus. I consider this publication as a summary of the intensive and extensive work done by Chris in Costa Rica.

The history of systematics, nomenclature and taxonomy of Neotropical Syrphidae cannot be understood without Chris's crucial contribution and his synthesis exercise to create larger generic concepts. The taxonomic work before Chris and his good friend Dick (VOCKEROTH 1969), summarized by HULL (1949), was rearranged into larger units or generic concepts. This action made possible to split them again into smaller taxa with the help of molecular



Figs 9–12: F. Christian THOMPSON at different international congresses and symposia. – **9:** Chris and Betty THOMPSON at the 7th International Congress of Dipterology in 2010, Costa Rica. Photo: X. MENGUAL; – **10:** Chris and Tore R. NIELSEN at the 5th International Symposium on Syrphidae in 2009, Serbia. Photo: M. HAUSER; – **11:** Chris (left), Mírian N. MORALES (right) and myself (center) during the field excursion at the 5th International Symposium on Syrphidae in 2009, Serbia. Photo: M. HAUSER; – **12:** (Left to right) Axel SSYMANK, myself, Chris, Jeffrey H. SKEVINGTON and Andrew D. YOUNG at the 8th International Symposium on Syrphidae in 2015, Germany. Photo: A. SCHÄFER.

data. It was necessary to lump before we could split taxa properly. During the last 15 years, molecular data have been used to decipher the clades within the broad generic concepts suggested by Chris and their relationships. In most cases, old names and old generic concepts reemerged or were redefined (MENGUAL & THOMPSON 2011; THOMPSON 2012; MIRANDA et al. 2014; MENGUAL et al. 2018; MIRANDA et al. 2020, among others). We can say that most (if not all) current researchers working on Neotropical flower flies are somehow disciples of Chris.

Chris was also the first researcher to apply cladistics to infer evolutionary relationships within Syrphidae and the last ‘syrphidologist’ that had a global perspective and world-wide knowledge on this family of dipterans. However, if we need to value Chris’s legacy in Neotropical dipterology, we must not forget the influence and importance of the *BioSystematic Database of World Diptera* (BDWD), now *Systema Dipterorum* (EVENHUIS & PAPE 2022) (see EVENHUIS et al. 2010; THOMPSON & PAPE 2016; EVENHUIS et al. 2023). As EVENHUIS (2021) says, his passion for computers, names and databasing made him one of the first bioinformaticians even before the term “bioinformatics” was ever coined. Besides Syrphidae, Chris published on Neotropical Calliphoridae (THOMPSON 1973), Richardiidae (PEREZ-GELABERT & THOMPSON 2006), Braulidae (BROWN & THOMPSON 2010), Conopidae (SKEVINGTON et al.

2010), Cryptochetidae (MCALPINE & THOMPSON 2010), and Tanypezidae (APIGIAN & THOMPSON 2010). Outside the Neotropics, Chris was one of the authors of the chapter devoted to Syrphidae in all but one of the published Manuals (VOCKEROTH & THOMPSON 1987; THOMPSON & ROTHERAY 1998; THOMPSON et al. 2010) and almost all the Catalogs on Diptera (KNUTSON et al. 1975; THOMPSON et al. 1976; THOMPSON & VOCKEROTH 1989). His contributions went beyond Syrphidae, publishing on 18 other families (Anisopodidae, Anthomyiidae, Bibionidae, Brulidae, Calliphoridae, Conopidae, Cryptochetidae, Culicidae, Lygistorrhinidae, Muscidae, Pipunculidae, Rhagionidae, Richardiidae, Sciomyzidae, Simuliidae, Tabanidae, Tachinidae, and Tanypezidae).

My experience working with Chris during all these years is just an example of two of his many virtues: his enormous generosity and commitment to open science, and his endless willingness to help, especially students. He believed in open data but was simultaneously overly suspicious about people stealing his ideas; an odd and impossible juxtaposition that led to a lot of conflicts. He constantly took part in the International Symposia on Syrphidae and the International Congresses of Dipterology, where it was common to see Chris talking with colleagues and taking notes (compare Figs 9–12 on previous page). During the last two decades since we met, Chris's knowledge on entomology, taxonomy, nomenclature, science history and bibliography did not stop surprising me every now and then, but in a very natural way like what he was saying now was something that everyone knows by default. His personal library is full of bibliographic treasures and original copies of rare books and editions. I inherited from him the passion for printed copies and followed his example. As Chris told me during my 2005 visit, “information is power” – only by having the relevant bibliographic information are we able to make authoritative taxonomic decisions. My postdoc under his supervision started with another unforgettable sentence from Chris: “All my students got a good job afterwards, and you will not fail me”. Oh, well ..., I did my best.

Acknowledgements

I thank Betty THOMPSON for all her support during my visits to Washington, D.C. and for her help in settling down in North Virginia. I also thank Jeffrey H. SKEVINGTON and Gil F. G. MIRANDA for their valuable comments.

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Author's address

Ximo MENGUAL

Zoologisches Forschungsmuseum Alexander Koenig
Leibniz-Institut zur Analyse des Biodiversitätswandels
Adenauerallee 127
53113 Bonn
Germany
E-mail: x.mengual@leibniz-lib.de