BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME	POSITION TITLE
Maria Contel	**Associate Professor** Inorganic Chemistry **Brooklyn College, CUNY**
eRA COMMONS USER NAME MCONTEL	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Zaragoza (Spain)	BSc/MSc	1993	Chemical Sciences, Inorganic Chemistry
Public University of Navarra (Spain)	Ph.D	1996	Chemistry
Australian National University (Australia)	Postdoc	1997-1999	Organometallics
University of Utrecht (The Netherlands)	Postdoc	1999-2000	Organometallics
University of Zaragoza-CSIC (Spain)	Senior Researcher	2001-2006	Homogeneous Catalysis

A. PERSONAL STATEMENT

Research qualifications and PI developmental plan

My research program focuses on the synthesis and characterization of transition-metal complexes (mainly gold but also titanium, silver, copper, palladium and platinum) and their applications as: a) anticancer and antimicrobial agents and b) as catalysts in reactions of industrial interest (including but not limited to oxidations and C-C and C-Heteroatom bond formation). My first NIH funded research (SC2 award, Feb 2010-June 2013) focused on the preparation of gold compounds with phosphorous-containing pincer ligands. The long-term goal of my research is the development of novel metal-based anticancer chemotherapeutics that can overcome some of the drawbacks associated with the use of platinum drugs. More recently (since 2011) we have focused on the preparation of heterometallic gold complexes as anticancer and as antimicrobial agents. Our hypothesis is that the incorporation of two different metals with anti-tumor properties in the same molecule will improve their activity due to: a) interaction of the different metals with multiple biological targets and b) improved chemicophysical properties of the resulting heterometallic compound. In this context we have reported that such an approach is a feasible one and that new titanium-gold complexes may be promising candidates with improved antitumor properties with respect to their monometallic (titanium and gold) precursors in different cancers (*Inorg. Chem*. 2011). These studies formed the preliminary data for an NIH-SC1 proposal (July 2013-June 2017) and now we have data for the real potential of these derivatives in renal and prostate cancer (*Organometallics* 2014, 2016) including relevant *in vivo* work in mice (*Chem. Sci*. 2015, US patent). We have extended our work to include ruthenium-gold derivatives with improved anticancer profiles (*Dalton Trans*. 2015, *Chem. Commun*. 2016). Some of these heterometallic complexes incorporate stable and active gold(I)-heterocyclic carbene (NHC) fragments. During my career I have published 33 articles on the synthesis and applications of gold organometallic and coordination complexes and another 20 on the synthesis of compounds from different transition metals.

Since I joined Brooklyn College in 2006 I have supervised 3 research associates, 7 graduate, 26 undergraduate and 3 high school students, with over 75% of them coming from groups underrepresented in chemistry (minority students, females and persons with disabilities) including MARC and LSAMP students. Many of the undergraduate students were co-authors in publications and 6 of these students joined PhD programs in biomedical areas (chemistry, biochemistry and biology) while most of the others went to medical schools. The two most recent high school students (Catherine Hua and Jennifer Nwenyi from the Brooklyn Technical High School) will join MIT and Harvard University in the Fall of 2017 to pursue studies in chemistry. I have also supervised 4 students from foreign universities who have done either a masters or a

PhD research stay in my group. I am currently the mentor of Prof. Guillermo Gerona-Navarro, a new Assistant Professor at the Chemistry Department of Brooklyn College for his SCORE SC2 application which was awarded in 2014. I am also part of the mentoring team for Prof. Mariana Torrente, an Assistant Professor at the Chemistry Department of Brooklyn College starting in August 2015 and holder of a K22 award from NIH.

I am a regular reviewer for a variety of prestigious journals in chemistry and medicinal chemistry and a regular reviewer of NSF and PRF grants (I was a member in one NSF panel in 2011) and of some grants from other countries (such as Hong Kong Council Review, Czech Republic Science Ministry, National Research Foundation (NRF) of South Africa or the Israel Science Foundation) in the areas of medicinal inorganic chemistry, organometallic chemistry and homogeneous catalysis.

B. POSITIONS AND HONORS

Positions and Employement

1997-1999 Postdoctoral Fellow. *Subject*: Synthesis of organometallic compounds with bridging $C_6H_4PR_2$ (R = Ph, Et) ligands. *Location*: Research School of Chemistry, Australian National University, Australia. *Supervisor*: Prof. Martin A. Bennett.

1999-2000 Postdoctoral Fellow. *Subject*: Synthesis of orthometallated gold compounds with NCN ligands. *Location*: Metal-Mediated Organic Synthesis Department. Debye Institute. University of Utrecht. The Netherlands. *Supervisor*: Prof. Gerard van Koten.

2000-2001 Research Associate. Funded by the Spanish Ministry of Science and Education and CSIC. *Subject*: Complexes with polyfunctional thiolates. *Location*: Materials Science Institute of Aragón, Zaragoza. *Advisor*: Prof. Mariano Laguna.

2002-2006 Senior Research Contract "Ramón y Cajal". Spanish Ministry of Science and Education. 5-year Senior Research Position. *Subject*: Compounds of groups 10 and 11 metals as recyclable catalysts for carbon-carbon and carbon-heteroatom bond formations. *Location*: Inorganic Chemistry Department, University of Zaragoza. Spain.

2006-2010 Assistant Professor (Inorganic Chemistry). Chemistry Department, Brooklyn College and The Graduate Center, City University of New York (CUNY).

2014 Fall- Present Faculty, Biology PhD Program, The Graduate Center, CUNY

JAN 2011-Present Associate Professor (Inorganic Chemistry). Tenured in August 2011. Chemistry Department, Brooklyn College and The Graduate Center, CUNY.

Honors and Awards

2015-2016	Tow Professor (at Brooklyn College)
2014-present	Associate Member of the University of Hawaii Cancer Center (Cancer Biology Program, Natural Products and Experimental Therapeutics).
2013	Tow Travel Faculty Fellowship (Brooklyn College). To perform a research stay during the Fall 2013-Spring 2014 academic year at the University of Hawaii-Cancer Center.
2007	Project Kaleidoscope Faculty Fellow for the 21st Century (PKAL F21) Class of 2007.
2006	Prominent Research Career Report (I3 Program): Positive Evaluation. ANEP, Spanish National Agency of Evaluation and Prospective.
2002-2006	Ramon y Cajal Senior Research Position. Most prestigious Spanish Research Fellowship for Young Investigators.
2005	Teaching Competence Certification (certification to be a University Assistant/Associate Professor in the area of Inorganic Chemistry). ANECA, Spanish National Agency of Evaluation and Academic Certifications.

C. CONTRIBUTION TO SCIENCE

57 peer reviewed articles (including 1 review, 2 book chapters, and a book review), 1 patent issued and 1 filed and published, over eighty communications or invited talks at National and International Conferences.

1) **Gold homo and heteronuclear compounds and clusters** (PhD studies Advisors: Prof. Laguna and Prof. Garrido). From the results obtained during my PhD, I published 10 papers. My work dealt with the preparation of novel polynuclear gold complexes to study the formation of supported and unsupported Au-Au and Au-M (Ag, Cu, Sn, Ge) bonds and interactions. These studies were relevant at the time since the effects of aurophilicity were starting to be described in the literature. The aurophilicity (due to relativistic effects) make gold and gold compounds quite unique in their chemical reactivity and have allowed for the explanation of their unexpected behavior in some catalytic processes. My two selected publications are:

- 'Trinuclear Au_2Ag and Au_2Cu Complexes with Mesityl Bridging Ligands. X-Ray Structure of the One-dimensional Chain Polymer $[\{Au(\mu\text{-mes})(AsPh_3\}_2Ag]ClO_4$'. **Contel**, **M**.; Garrido, J.; Gimeno, M.C.; Jones, P.G.; Laguna, A.; Laguna, M. *Organometallics* , **1996**, *15*, 4939.
- 'A New, Simple Route to Novel Gold Clusters: Structure of an Au_6Ag Wheel with a Gold Rim´. Cerrada, E.; **Contel**, **M**.; Valencia, A.D.; Laguna, M.; Gelbrich, T.; Hursthouse, M.B. *Angew. Chem. Int. Ed.*, **2000**, *39*, 2353.

2) **Organometallic compounds with pincer P-C and N-C-N ligands** (Postdoctoral Studies). In my first position (Advisor Prof. Bennett), I prepared mono and polynuclear organomercury complexes containing palladium and platinum and was able to assess and describe bonds and interactions Hg-Pd and Hg-Pt. I used and developed ^{199}Hg NMR spectroscopy to study such interactions. I also used the organomercury compounds to cleanly transfer the organic groups to Pt, Ru and Os centers. My second postdoctoral position (Advisor Prof. van Koten) dealt with the preparation of gold compounds with N-C-N ligands in different oxidation states. My main achievement in this period was to discover the ability of $[AuPPh_3]^+$ fragments to act as Li^+ or $MgBr^-$ equivalents (based on the isolobality of $AuPPh_3^+$ and H^+ and Li^+). In this way I was able to use R-Au-PPh_3 compounds as transmetallating agents to different metallic centers (Au^{III}, Pt^{II}, Pd^{II}, Ni^{II}, Fe^{III}, and Ti^{IV}). This is an air stable alternative to lithiated and Grignard reagents when these compounds cannot be used due to the problem of reduction of the metallic centers. It is also a much less toxic alternative to organomercury reagents and a step forward in Green Chemistry. These two positions rendered 5 publications and I was invited to talk at the XVIIIth International Conference on Organometallic Chemistry (Munich, 1998, the most prestigious Conference in the field). My two selected publications are:

- 'Bis{2-diphenylphosphino)phenyl}mercury: a novel bidentate ligand and transfer reagent for the o-$C_6H_4PPh_2$ group'. Bennett, M.A.; **Contel, M**.; Hockless, D.C.R.; Welling, L.L. *Chem. Commun.*, **1998**, 2401.
- ´A Bis(ortho-amine)aryl-Gold(I) Compound as an Efficient, Nontoxic, Arylating Reagent´. **Contel**, **M.**; Stol, M.; Casado, M.A.; van Klink, G.P.M.; Ellis, D.D.; Spek, A.L.; van Koten, G. *Organometallics,* **2002**, *21*, 4556.

3) **Gold complexes in homogenous catalysis** (Senior Researcher UZ, Assistant/Associate Professor at BC). After my postdoctoral studies I returned to Spain and I worked as a Research Scientist at the University of Zaragoza-CSIC (Department of Inorganic Chemistry). I was awarded a Ramon y Cajal Fellowship in 2002, the most prestigious 5-year fellowship in Spain for young investigators (we could not apply for our own research funds to Federal Agencies and thus had to work with an established PI). I continued with this topic when I first arrived at Brooklyn College and published 8 articles (6 as PI or co-PI). At the time I started the project in 2003 there were only 5 publications (3 very old) of gold homogeneously-catalyzed processes. I focused on establishing reaction mechanisms by *in situ* spectroscopic techniques (mainly NMR). I studied different reactions such as: addition of water and alcohols to alkynes, formation of C-C and C-heteroatom bonds and hydrosilylation. My first piece of work in the field (with undergraduate students R. Casado and S. Sanz) was accepted as a full paper in J. Am. Chem. Soc. and it has been highly cited in the field (over 235 citations).

- ´Organometallic Gold(III) Compunds as catalysts for the Addition of Water and Methanol to Terminal Alkynes´. Casado, R.; **Contel**, M.; Laguna, M.; Romero, P.; Sanz, S. *J. Am. Chem. Soc.* **2003***, 125,* 11925.

- ‘Mechanistic Insights in the One-Pot Synthesis of Propargylamines from Terminal Alkynes and Amines in Chlorinated Solvents Catalyzed by Gold Compounds and Nanoparticles’. Aguilar, D.; **Contel, M**; Urriolabeitia, E.P. *Chem., A Eur. J.* **2010**, *16*, 9287.

4) Green chemistry: recyclable catalysts (Senior Researcher UZ, Assistant/Associate Professor at BC). I published 5 papers, and 2 book chapters all as PI or co-PI with one article just submitted in March 2016. I worked in: 1) the preparation of recyclable fluorous copper compounds as catalysts for the oxidation of alkenes, alkanes and alcohols, and 2) recyclable gold compounds in reactions of hydrosilylation, oxidation and the formation of C-C bonds. The copper catalysts proved to be very efficient (and in some cases with just air or O_2 as oxidizing agents) and could be recycled and re-used without much loss of catalytic activity. We were also able to study the reaction mechanisms by *in situ* EPR spectroscopy. Subsequent work allowed for the preparation of recyclable fluorous copper compounds with thermomorphic properties which permitted their use in oxidation catalysis without fluorous solvents. A selected publication below:

- ´Fluorous Biphasic Catalysis: Synthesis and Characterization of Copper(I) and Copper(II) Fluoroponytailed 1,4,7-Rf-TACN and 2,2’-Bipyridine Complexes and Demostration of their Catalytic Activity in the Oxidation of Hydrocarbons, Olefins, and Alcohols, Including Mechanistic Implications´. **Contel, M**.; Izuel, C.; Fish, R.; Laguna, M.; Villuendas, P.R.; Alonso, P.J. *Chem. A. Eur. J.* **2003***, 9,* 4168*.*

5) **Metallodrugs as antimicrobial and anticancer agents**. I have worked in this field at Brooklyn College since 2009 funded by NIH (NIGMS SC2 grant 2010-2013 and by NCI S1 grant 2013-2017). More recently my group has reported on the *in vivo* studies of two selected compounds (ruthenium- and gold-titanocene-based derivatives) on breast and renal cancer respectively with impressive tumor reductions and improved pharmacological profiles. More specifically the ruthenium derivative (a cheap, low molecular weight compound, water soluble and with low toxicity *in vivo*) was able to reduce the tumor size of MDA-MB 231 xenografts in mice in 56 %. This makes it the best ruthenium compound reported so far. The work on the highly active titanocene-gold derivative on renal cancer represents the first *in vivo* study of a heterometallic anticancer compound along with the best results obtained on renal cancer for a metal-based drug. I have published 20 papers on this topic since 2009, and I have one patent recently issued and one filed and published (waiting for notice of allowance). I have also published 5 papers in the area of antimicrobial metallodrugs. I have been invited to talk at different International Conferences and I was the organizer and co-Chair of the ‘*1st International Symposium on Clinical and Experimental Metallodrugs in Medicine: Cancer Chemotherapy*’ held in Honolulu (December 12th-15th, 2015, http://cemm.brooklyn.cuny.edu/) and partly funded by a R13 grant. Three recent selected publications and the issued patent are:

-‘Titanocene Gold Derivatives Comprising Thiolato Ligands’. **Contel, M**.; Fernández-Gallardo, J.; Elie, B.T. Ramos, J.W. US Patent 9,315,531 (04/19/2016).
- ‘Versatile Synthesis of Cationic N-Heterocyclic Carbene-Gold(I) Complexes Containing a Second Ancillary Ligand. Design of Heterobimetallic Ruthenium-Gold Anticancer Agents’. Fernández-Gallardo, J.; Elie, B.T.; Sanaú, M.; **Contel, M**. *Chem. Commun*. **2016**, *52*, 3155-3158.
- ’Heterometallic titanium–gold complexes inhibit renal cancer cells in vitro and in vivo’. Fernández-Gallardo, J.; Elie, B. T.; Sadhukha, T.; Prabha, S.; Sanaú, M.; Rotenberg, S. A.; Ramos, J. W.; **Contel, M.** *Chem. Sci.* **2015**, *6*, 5269-5283.
- ‘*In vitro* and *in vivo* Evaluation of Water-soluble Iminophosphorane Ruthenium(II) Compounds. A Potential Chemotherapeutic Agent for Triple Negative Breast Cancer’. Frik, M.; Martínez, A.; Elie, B.T.**;** Gonzalo, O.; Ramirez de Mingo, D.; Sanaú, M.; Sánchez-Delgado, R.; Sadhukha, T.; Prabha, S.; Ramos, J.; Marzo, I.; **Contel, M**. *J. Med. Chem.* **2014**, *57*, 9995.

List of Published Work in MyBibliography (unfinished):

http://www.ncbi.nlm.nih.gov/myncbi/browse/collection/47997971/

D. RESEARCH SUPPORT

Ongoing Research support

NIH/NCI 1SC1CA182844-03 Contel (PI) 07/01/13-06/30/2017
Titanium-gold-based chemotherapeutics for prostate and kidney cancer $1,413,000

Tow Foundation Contel (PI) 06/01/15-05/30/2017
Tow Professor 2015-2017 $25000 (for research)

Submitted (May 23rd 2016)

NIH/NCI 2SC1CA182844-05 Contel (PI) 07/01/17-06/30/2021
Biodegradable nanocarriers and antibodies as targeting delivery vehicles for cancer metallodrugs $1,570,000

Completed Research Support (Last three years)

CUNY-Advanced Science Research Center (SEED grants) Contel (PI) 06/01/15-05/31/2016
Improving selectivity and delivery of potential organometallic-based cancer chemotherapeutics by using peptide- and carbohydrate- amphiphiles as mobile nanocarriers $10000

NIH/NCI 1R13CA200223-01A1 Contel(PI) 09/01/2015-05/31/2016
Organization Conferences: 1st International Symposium on Clinical and Experimental Metallodrugs in Medicine: Cancer Chemotherapy (CEMM). Honolulu (UHCC) December 2015 $5000

NIH/NIGM SC2GM082307 Contel (PI) 02/01/10-06/30/2013
Organogold phosphorus-containing compounds as anticancer agents $471,000