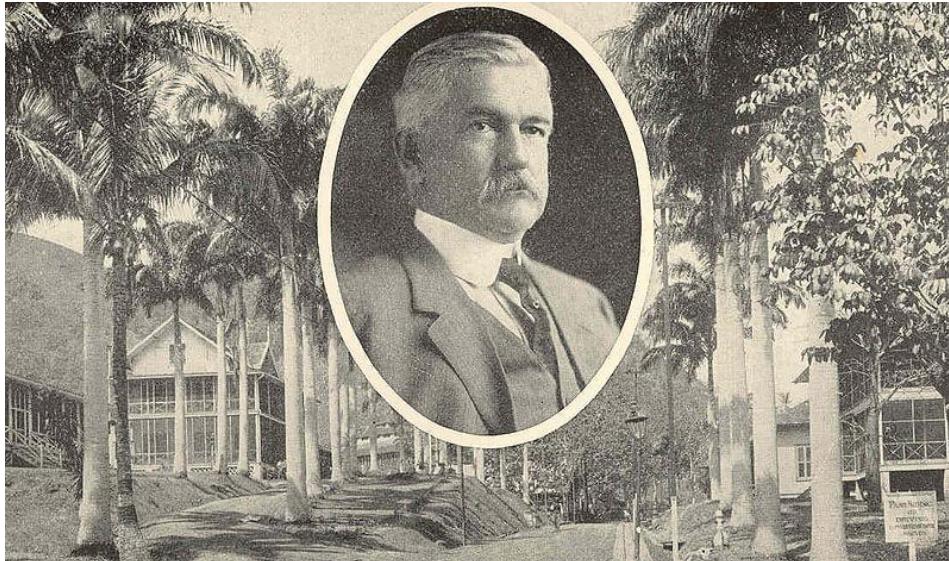


# Avances en Computación en Ciencias de la Vida y Aplicaciones en el Agro

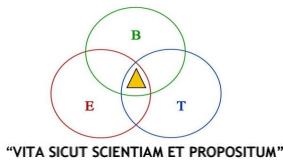
Javier Sánchez Galán, PhD

Grupo de Investigación en Biotecnología, Bioinformática y Biología de Sistemas – GIBBS  
Universidad Tecnológica de Panamá  
23 de abril de 2018

# Science in Panama



# About Me



## Short Bio:

BSc. Computer Systems Engineering, UTP  
MSc, Computer Science (Bioinformatics), McGill  
PhD, Experimental Medicine, McGill

I am a bio/chemo-infomatician with interest in innovative approaches for bridging computational and data analysis approaches for biology, chemistry, medicine, agriculture and climate research.

I am a researcher at the Centro de Producción e Investigaciones Agroindustriales (CEPIA)-UTP. Grupo de Investigaciones en Biotecnología, Bioinformática y Biología Sintética (GIBBS). Professor at Facultad de Ingeniería de Sistemas Computacionales (FISC). Adjunct Researcher at INDICASAT-AIP.

## Research interest:

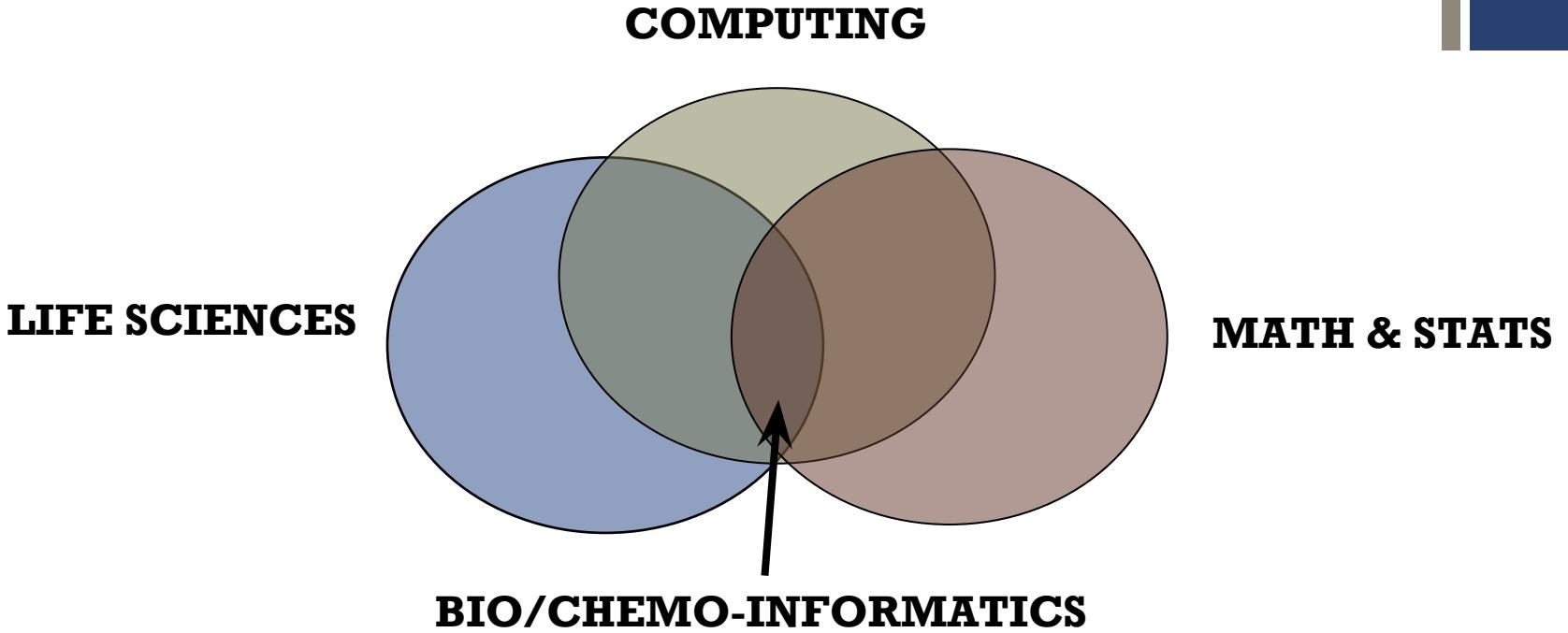
- Machine learning and multivariate analysis applied to spectral signals (Mass Spectrometry, Near-infrared Spectroscopy). Also images, sounds.
- Applied High Performance Computing

+

Molecular Bio & Medicine



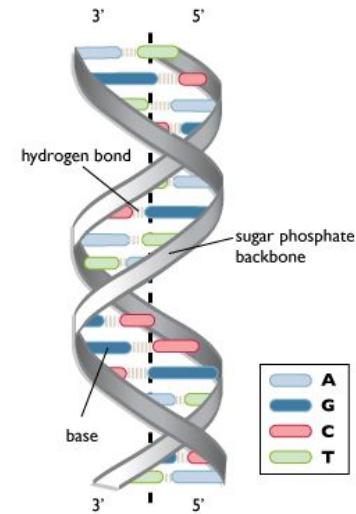
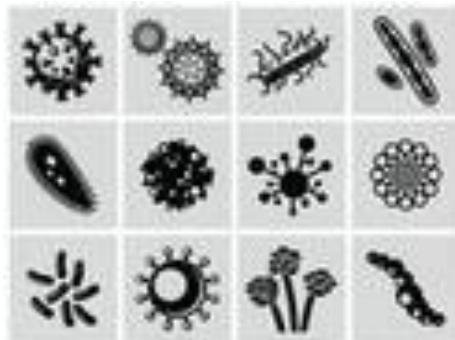
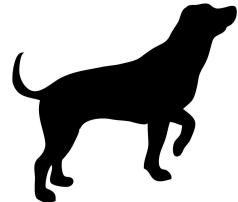
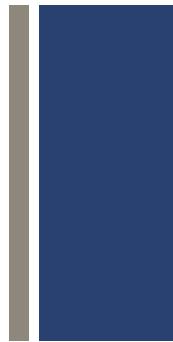
# Bioinformatics?



***Bioinformatics:*** study of the computational methods needed for the generation, management, storage and analysis of biological data.

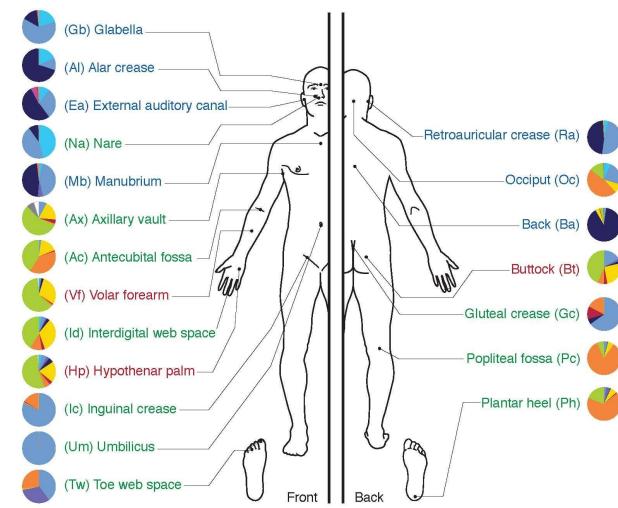
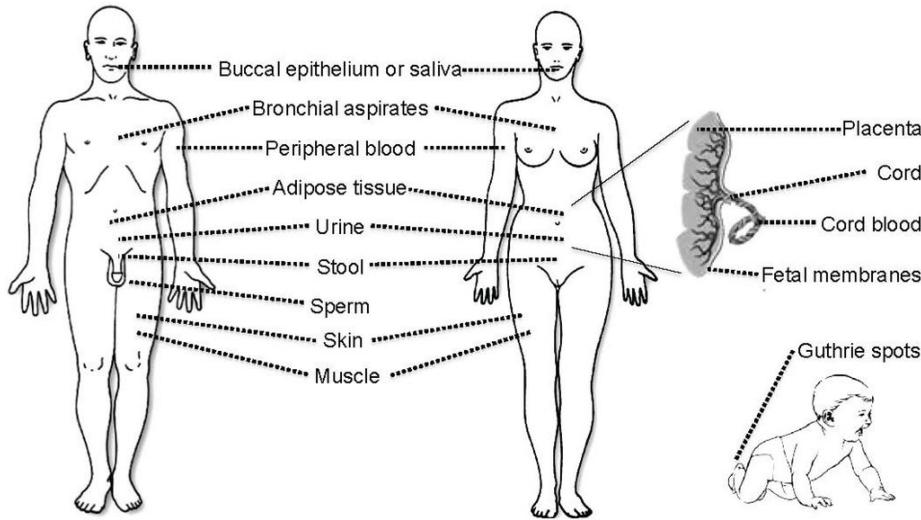
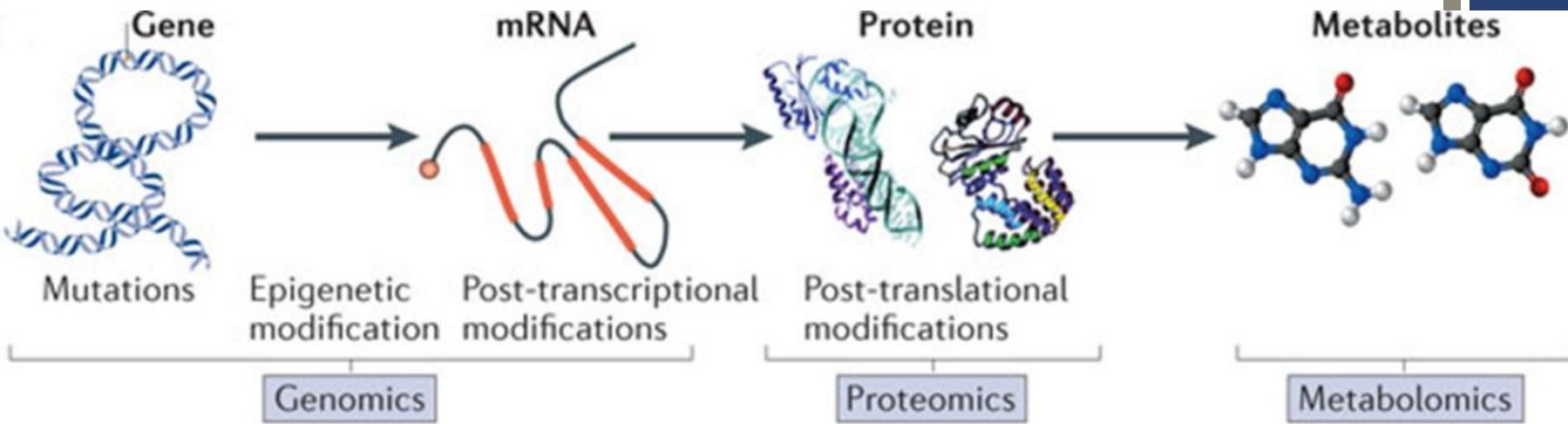


# Range of Action of Bioinformatics



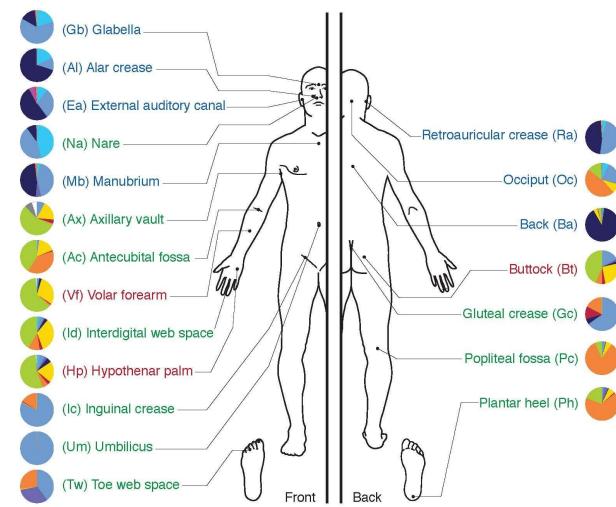
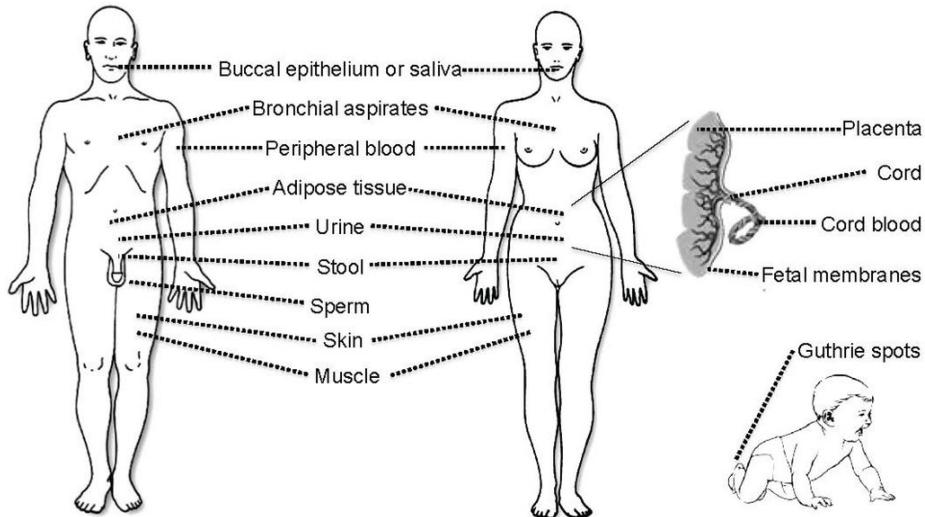
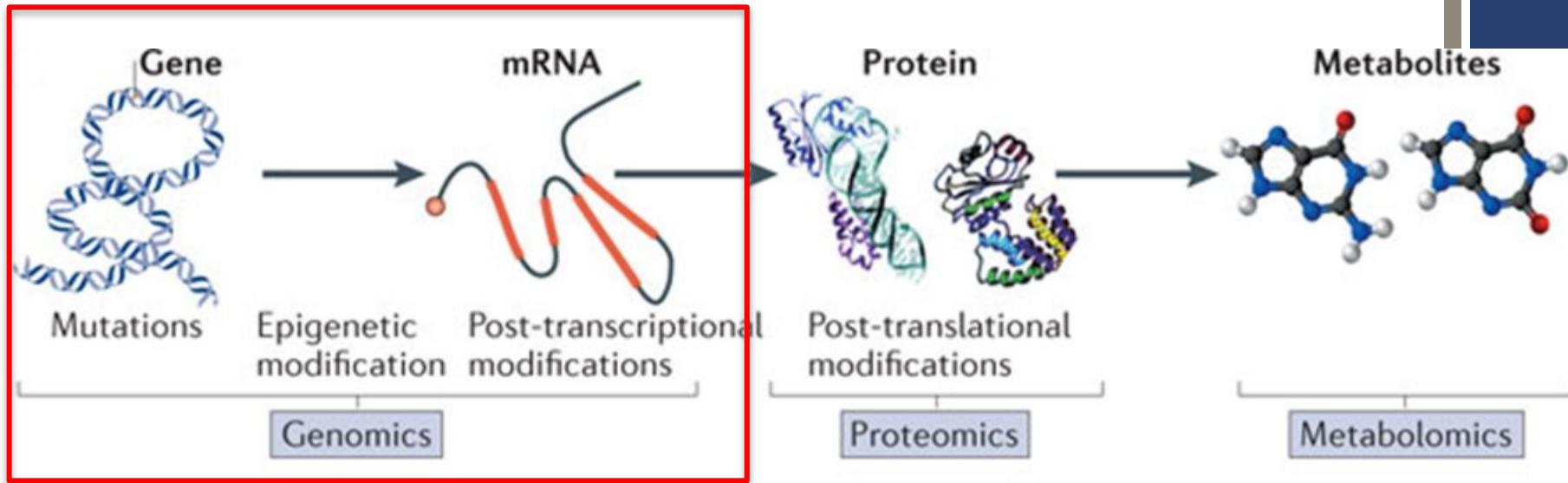


# “-omics” Sciences



# “-omics” Sciences

+





# Transcription Factor Binding Site (TFBS) Prediction



## A role for the ETS family of transcription factors in Angiopoietin-1/Tie-2 signaling axis

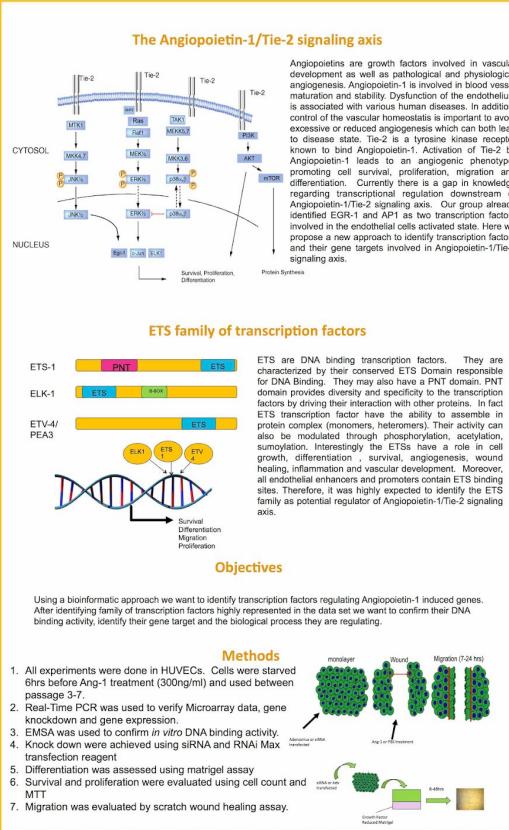
Sharon Harel<sup>1</sup>, Javier Sanchez Galan<sup>2</sup>, Mathieu Blanchette<sup>2</sup>, Sheldon Magder<sup>1</sup> and Sabah Hussain<sup>3</sup>

<sup>1</sup>Department of Physiology, McGill University, Montreal, QC

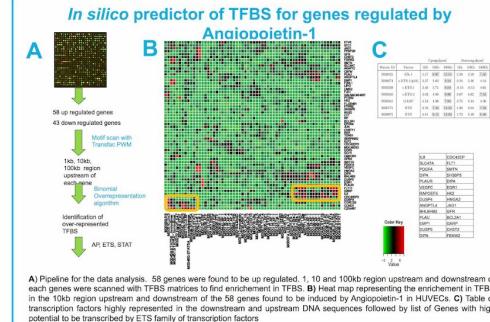
<sup>2</sup>School of Computer Sciences, McGill University Center for Bioinformatics, Montreal, QC

<sup>3</sup>Department of Medicine, McGill University

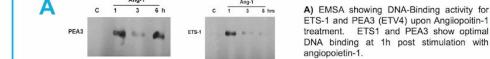
### Introduction



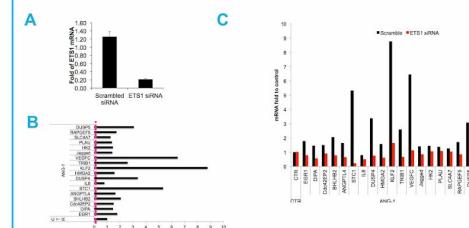
### Results



#### DNA binding activity of ETS is induced by Angiopoietin-1



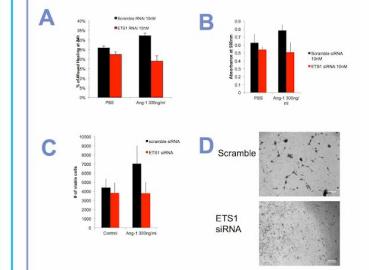
#### Identification of genes induced by Angiopoietin-1 and regulated by ETS-1



**A) Confirmation of genes induced by Angiopoietin-1.** A list of genes potentially regulated by ETS transcription factors was selected according to Z score and abundance. These genes were treated by Ang-1 (100ng/ml) by RT-PCR. **B) Selection of genes induced by ET1.** HUVECs were transfected either with scramble siRNA or ET1 specific siRNA and treated by Ang-1 for 2hrs and gene expression was assessed by RT-PCR (n=3).

### Biological roles

#### ET1 regulates ANG-1 induced migration ,survival and proliferation



### Conclusion

#### Our results show that:

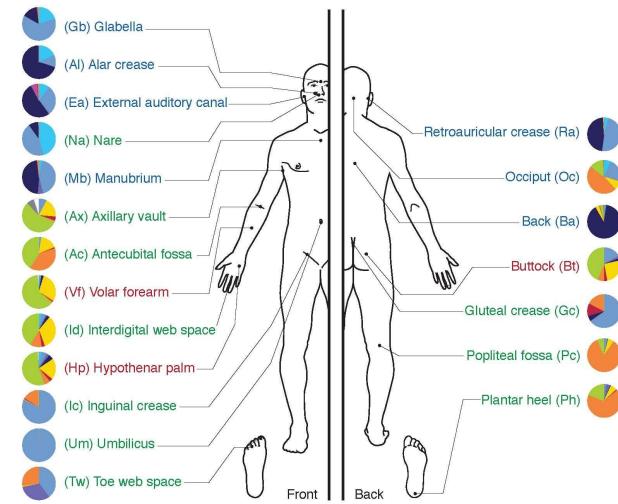
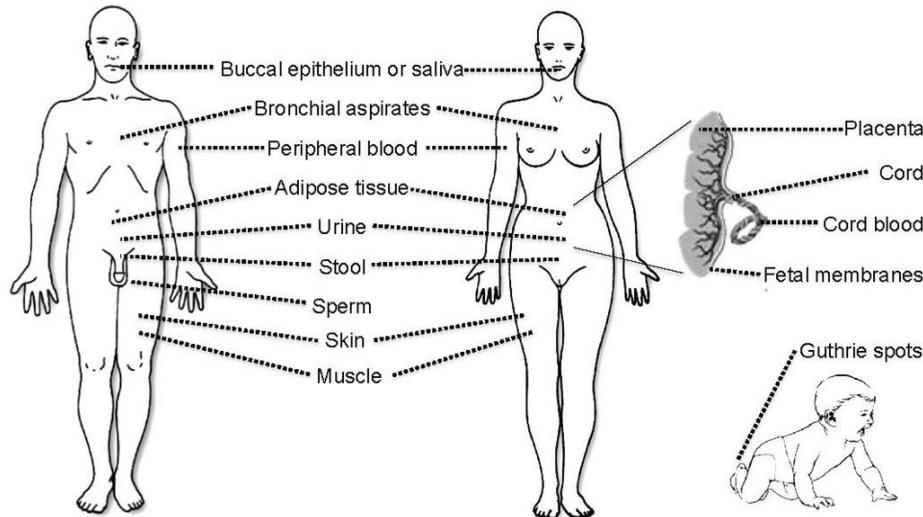
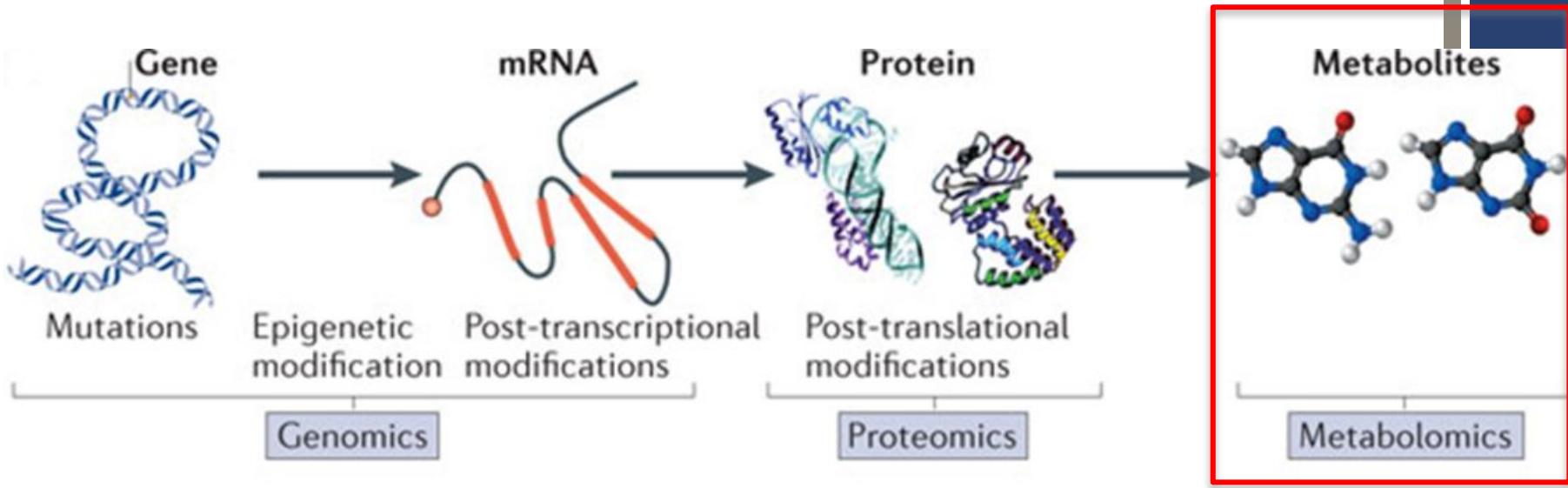
We were able to identify new transcription factors responsible for the angiogenic phenotype associated with Ang-1/Tie-2 activation. In addition we have accumulated evidence regarding which genes they might regulate and we were able to rapidly identify which biological outcome to study.

#### FUTURE PLANS

- Confirm the roles of ELK1 and ETV4
- Luciferase reporter assay
- Mobilization
- Activity of ETS in Tie-2 low cells
- Sprouting assay
- Stably knocking down ETS with lentivirus expressing shRNA
- Does ETS1 form a complex downstream of Ang-1/Tie-2

# “-omics” Sciences

+





# Use of Near-Infrared Spectroscopy and Chemoinformatic Analysis of Biological Fluids for the Assessment of Maternal-Fetal Health

Hindawi Publishing Corporation  
Journal of Pregnancy  
Volume 2011, Article ID 980985, 6 pages  
doi:10.1155/2011/980985

## *Research Article*

### **Use of Near-Infrared Spectroscopic Analysis of Second Trimester Amniotic Fluid to Assess Preterm Births**

**Kristin M. Power,<sup>1</sup> Javier E. Sanchez-Galan,<sup>2</sup> Gary W. Luskey,<sup>3</sup>  
Kristine G. Koski,<sup>2,4</sup> and David H. Burns<sup>1,2</sup>**

<sup>1</sup> Department of Chemistry, McGill University, Montreal, QC, Canada H3A 2K6

<sup>2</sup> Division of Experimental Medicine, Faculty of Medicine, McGill University, Montreal, QC, Canada H3A 1A3

<sup>3</sup> Division of Perinatal/Fetal Medicine, St. Mary's Hospital Center, Montreal, QC, Canada H3T 1H5

<sup>4</sup> School of Dietetics and Human Nutrition, McGill University, Hacdonald Campus, Montreal, QC, Canada H9X 3V9

Correspondence should be addressed to David H. Burns, david.burns@mcgill.ca



# Use of Near-Infrared Spectroscopy and Chemoinformatic Analysis of Biological Fluids for the Assessment of Maternal-Fetal Health

## Near-infrared Spectroscopy Characterizes Vitamin Deficiencies and Infection Status During Pregnancy in Panamanian Indigenous Mothers

Javier E. Sanchez-Galan<sup>1,2</sup>, Doris Gonzalez-Fernandez<sup>1,2</sup>, Enrique Murillo<sup>3</sup>, Marilyn Scott<sup>4</sup>, David H. Burns<sup>1,5</sup> and Kristine G. Koski<sup>1,6</sup>  
<sup>1</sup>Division of Experimental Medicine, McGill University, <sup>2</sup>Universidad Tecnológica de Panamá, <sup>3</sup>Universidad de Panamá, <sup>4</sup>Institute of Parasitology, McGill University  
<sup>5</sup>Department of Chemistry, McGill University, <sup>6</sup>School of Dietetics and Human Nutrition, McGill University

### Background and Rationale

Near-infrared (NIR) spectroscopy has been proposed as a diverse diagnostic tool for metabolic fingerprinting [1]. It has also been used to identify differences in healthy and pathological fluids such as blood [2], urine [3] and saliva [4].

It has also been used for the identification of viral infections in uninfected and infected fluids [5]. However, it has not been used to identify nutritional deficiencies in mothers and/or the contribution of these conditions to infected fluids.

### Study Objectives

To explore the possibility that NIR spectral analysis would identify differences in individuals with multiple micronutrient deficiencies.

The maternal micronutrient deficiencies that were explored were vitamin A, vitamin D, B12 and folate.

The prevalence of maternal infections including respiratory, skin and vaginal were studied.

### Methods

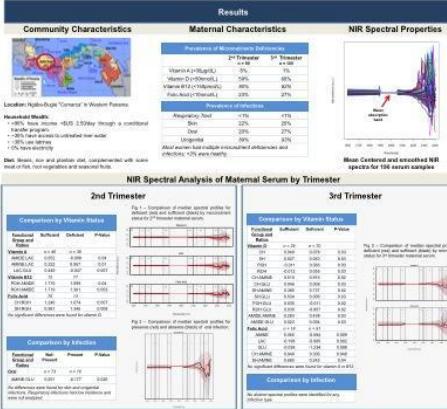
Serial NIR spectra were collected in the 1000-2000 nm range (100 wavenumbers, 512 nm resolution) from 100 healthy and 100 infected mothers. To determine the dietary intake and nutritional status of the mothers, a questionnaire was completed and precharacterization of respiratory, skin and vaginal infections was performed.

For each subject, two samples were collected at 200 nm apart.

The resulting spectral signals were averaged. Root mean square (RMS) spectra were selected for analysis.

These signals and their ratios were compared among the experimental conditions using Mann-Whitney U test and further biological interpretations of the results were made.

### Funding and Support provided by:



### Major Findings and Conclusions

For 2<sup>nd</sup> trimester, NIR spectral analysis was able to distinguish between healthy and infected mothers with a balance sufficient and different individuals. Also, distinct NIR profiles were identified in individuals with or without oral infections.

• Lactate was higher in vitamin A deficient mothers. Glucose was higher in mothers with no oral infection. Ammonium was higher in mothers with oral infection. B12 and folate indices, B-OM, were higher in B12 and folate deficient mothers.

For 3<sup>rd</sup> trimester, NIR spectral analysis was able to distinguish between healthy and infected mothers with sufficient and different individuals.

• Fatty acids (C6), Biotin (B1) and B-OM (B12) and folate (FOL) were higher in infected mothers than in healthy mothers. The levels of glucose in glucose were similar in both groups. The levels of triglycerides in infected mothers were lower in the infected group.

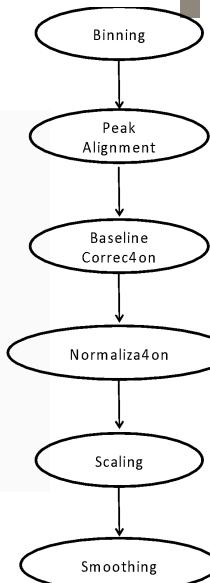
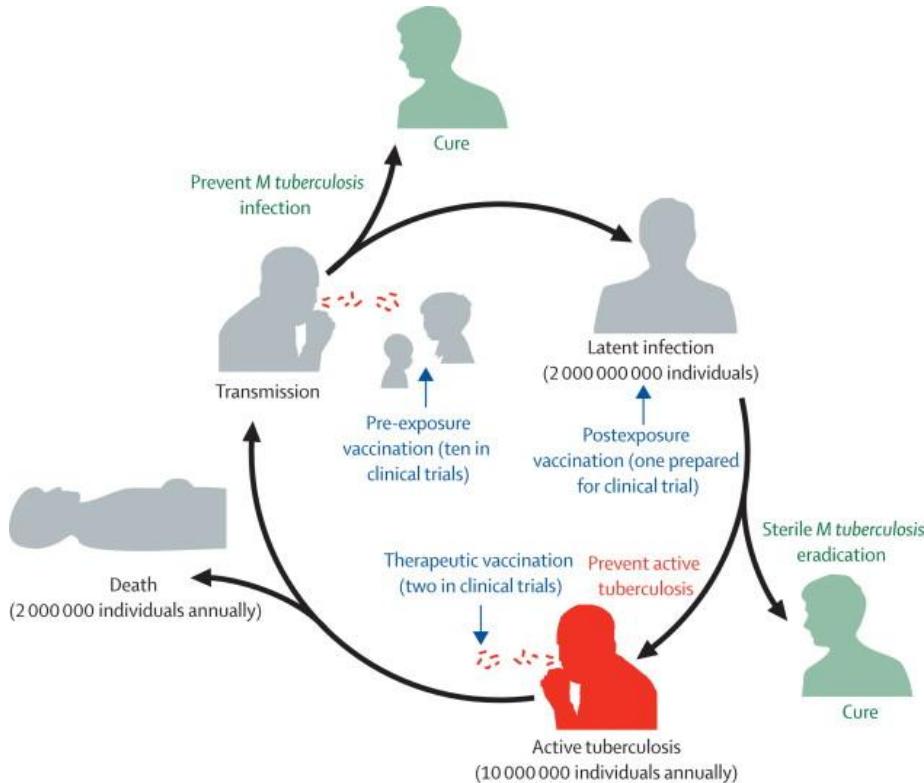
• Ammonium, Lactate and Glucose were lower in fat and serum samples. Two ratios C6 and SH to Amide were higher in infected mothers.

Conclusion: NIR spectroscopy was able to identify spectral differences between the material serum obtained from healthy and infected mothers during the 2<sup>nd</sup> and 3<sup>rd</sup> trimester of pregnancy by looking at changes in Fatty acids, Biotin, B-OM, folate, glucose, lactate and ammonium. This potential use of this technology in subsequent studies.

### References

1. Elie D, Gonzalez J, et al. (2006). The Analyst. 131:479-485.
2. Kite "New-age" J, et al. (2008). Journal. Opt. 30(1770).
3. Hall J, et al. (1995). Clinical Biochemistry. 28:403-409.
4. Hall J, et al. (1995). Clinical Biochemistry. 28:410-416.
5. Lutz J, et al. (1995). Annals of Applied Biology. 126:203-207.
6. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:101-106.
7. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:107-112.
8. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:113-118.
9. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:119-124.
10. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:125-130.
11. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:131-136.
12. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:137-142.
13. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:143-148.
14. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:149-154.
15. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:155-160.
16. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:161-166.
17. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:167-172.
18. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:173-178.
19. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:179-184.
20. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:185-190.
21. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:191-196.
22. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:197-202.
23. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:203-208.
24. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:209-214.
25. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:215-220.
26. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:221-226.
27. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:227-232.
28. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:233-238.
29. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:239-244.
30. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:245-250.
31. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:251-256.
32. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:257-262.
33. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:263-268.
34. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:269-274.
35. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:275-280.
36. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:281-286.
37. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:287-292.
38. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:293-298.
39. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:299-304.
40. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:305-310.
41. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:311-316.
42. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:317-322.
43. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:323-328.
44. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:329-334.
45. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:335-340.
46. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:341-346.
47. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:347-352.
48. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:353-358.
49. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:359-364.
50. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:365-370.
51. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:371-376.
52. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:377-382.
53. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:383-388.
54. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:389-394.
55. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:395-396.
56. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:397-398.
57. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:399-400.
58. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:401-402.
59. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:403-404.
60. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:405-406.
61. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:407-408.
62. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:409-410.
63. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:411-412.
64. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:413-414.
65. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:415-416.
66. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:417-418.
67. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:419-420.
68. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:421-422.
69. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:423-424.
70. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:425-426.
71. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:427-428.
72. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:429-430.
73. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:431-432.
74. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:433-434.
75. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:435-436.
76. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:437-438.
77. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:439-440.
78. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:441-442.
79. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:443-444.
80. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:445-446.
81. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:447-448.
82. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:449-450.
83. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:451-452.
84. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:453-454.
85. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:455-456.
86. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:457-458.
87. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:459-460.
88. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:461-462.
89. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:463-464.
90. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:465-466.
91. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:467-468.
92. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:469-470.
93. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:471-472.
94. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:473-474.
95. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:475-476.
96. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:477-478.
97. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:479-480.
98. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:481-482.
99. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:483-484.
100. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:485-486.
101. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:487-488.
102. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:489-490.
103. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:491-492.
104. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:493-494.
105. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:495-496.
106. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:497-498.
107. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:499-500.
108. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:501-502.
109. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:503-504.
110. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:505-506.
111. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:507-508.
112. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:509-510.
113. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:511-512.
114. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:513-514.
115. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:515-516.
116. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:517-518.
117. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:519-520.
118. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:521-522.
119. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:523-524.
120. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:525-526.
121. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:527-528.
122. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:529-530.
123. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:531-532.
124. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:533-534.
125. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:535-536.
126. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:537-538.
127. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:539-540.
128. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:541-542.
129. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:543-544.
130. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:545-546.
131. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:547-548.
132. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:549-550.
133. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:551-552.
134. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:553-554.
135. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:555-556.
136. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:557-558.
137. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:559-560.
138. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:561-562.
139. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:563-564.
140. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:565-566.
141. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:567-568.
142. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:569-570.
143. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:571-572.
144. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:573-574.
145. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:575-576.
146. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:577-578.
147. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:579-580.
148. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:581-582.
149. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:583-584.
150. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:585-586.
151. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:587-588.
152. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:589-590.
153. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:591-592.
154. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:593-594.
155. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:595-596.
156. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:597-598.
157. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:599-600.
158. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:601-602.
159. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:603-604.
160. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:605-606.
161. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:607-608.
162. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:609-610.
163. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:611-612.
164. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:613-614.
165. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:615-616.
166. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:617-618.
167. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:619-620.
168. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:621-622.
169. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:623-624.
170. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:625-626.
171. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:627-628.
172. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:629-630.
173. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:631-632.
174. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:633-634.
175. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:635-636.
176. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:637-638.
177. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:639-640.
178. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:641-642.
179. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:643-644.
180. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:645-646.
181. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:647-648.
182. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:649-650.
183. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:651-652.
184. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:653-654.
185. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:655-656.
186. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:657-658.
187. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:659-660.
188. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:661-662.
189. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:663-664.
190. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:665-666.
191. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:667-668.
192. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:669-670.
193. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:671-672.
194. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:673-674.
195. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:675-676.
196. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:677-678.
197. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:679-680.
198. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:681-682.
199. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:683-684.
200. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:685-686.
201. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:687-688.
202. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:689-690.
203. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:691-692.
204. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:693-694.
205. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:695-696.
206. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:697-698.
207. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:699-700.
208. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:701-702.
209. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:703-704.
210. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:705-706.
211. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:707-708.
212. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:709-710.
213. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:711-712.
214. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:713-714.
215. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:715-716.
216. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:717-718.
217. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:719-720.
218. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:721-722.
219. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:723-724.
220. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:725-726.
221. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:727-728.
222. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:729-730.
223. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:731-732.
224. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:733-734.
225. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:735-736.
226. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:737-738.
227. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:739-740.
228. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:741-742.
229. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:743-744.
230. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:745-746.
231. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:747-748.
232. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:749-750.
233. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:751-752.
234. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:753-754.
235. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:755-756.
236. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:757-758.
237. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:759-760.
238. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:761-762.
239. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:763-764.
240. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:765-766.
241. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:767-768.
242. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:769-770.
243. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:771-772.
244. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:773-774.
245. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:775-776.
246. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:777-778.
247. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:779-780.
248. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:781-782.
249. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:783-784.
250. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:785-786.
251. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:787-788.
252. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:789-790.
253. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:791-792.
254. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:793-794.
255. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:795-796.
256. Mazzoni S, et al. (2003). Journal of Clinical Chemistry and Laboratory. 49:797-798.
257. M

# + TB Project: Serological Biomolecule Profiling and Biopattern Recognition in Tuberculosis Diagnosis and Treatment Monitoring





PA-19

**ESPECTROMETRÍA DE MASAS MALDI PARA EL ANÁLISIS DE miRNA: UNA NUEVA POSIBILIDAD EN EL DIAGNÓSTICO DE LA TUBERCULOSIS**

**Didio A Ortiz<sup>1</sup>, Juan C. Rojas<sup>1</sup>, Sara Rosero<sup>1,3</sup>, Diego Reginensi<sup>1</sup>, Rolando A. Gittens<sup>1,2</sup>, Javier Sanchez Galan<sup>1,2</sup>, Amador Goodridge<sup>1,3,4</sup>**

PA-74

**UTILIZACION DEL ANÁLISIS DISCRIMINANTE CON MÍNIMOS CUADRADOS PARCIALES (PLS-DA) EN EL ESTUDIO DE SEÑALES EN ESPECTROMETRIA DE MASAS**

**Yoran Fumont<sup>1</sup>, Fernando Merchan<sup>2</sup>, Javier Sanchez-Galan<sup>3</sup>**

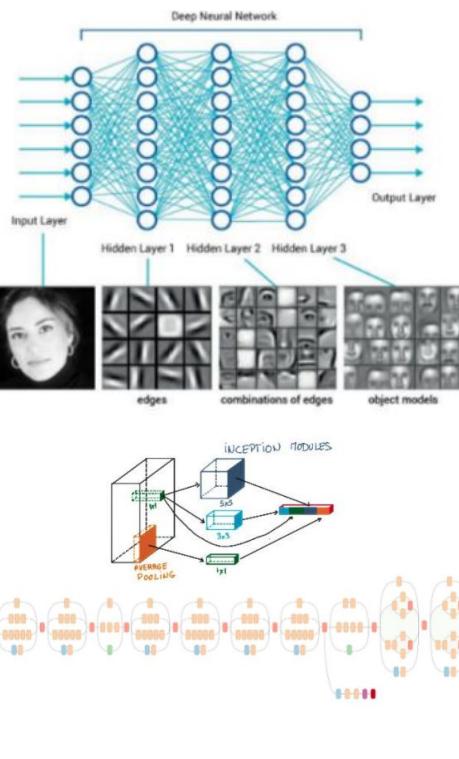
PA-79

**ESTUDIO DE TECNICAS DE PROCESAMIENTO DE SEÑALES APLICADAS A LOS PERFILES ESPECTRALES PROVENIENTES DE ESPECTROMETRIA DE MASAS**

**Salomón Mitre<sup>1</sup>, Fernando Merchan<sup>2</sup>, Javier Sanchez-Galan<sup>3,4</sup>**

+

Bio & Agro



## Conference Paper

# Uso de Redes Neuronales Convolucionales para el Reconocimiento Automático de Imágenes de Macroinvertebrados para el Biomonitorreo Participativo

Carlos Quintero<sup>1</sup>, Fernando Merchán<sup>1</sup>, Aydee Cornejo<sup>2</sup>,  
and Javier Sánchez-Galán<sup>1,3</sup>

<sup>1</sup>Universidad Tecnológica de Panamá, Panamá

<sup>2</sup>Grupo de Investigación en Macroinvertebrados Dulceacuícolas de Panamá. Instituto Conmemorativo Gorgas de Estudios de la Salud (ICGES)

<sup>3</sup>Instituto de Investigaciones Científicas y Servicios de Alta Tecnología AIP (INDICASAT AIP)



"Ampullariidae" "Ancyliidae" "Corbiculidae" "Hydrobiidae" "Lymnaeidae" "Calopterygidae" "Gomphidae" "Heptageniidae" "Heteragrionidae"



"Neritidae" "Physidae" "Planorbidae" "Sphaeriidae" "Thiaridae" "Leptophlebiidae" "Perilestidae" "Polythoridae"



## Conference Paper

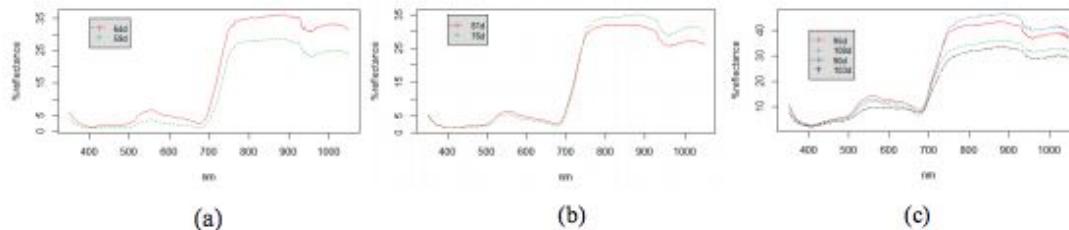


# Análisis prospectivo de la detección hiperespectral de cultivos de arroz (*Oryza sativa L.*)

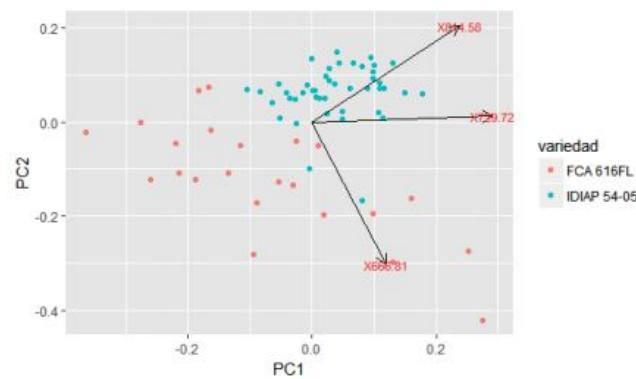
Jorge Serrano<sup>1</sup>, José Fábrega<sup>1</sup>, Evelyn Quirós<sup>2</sup>, Javier Sánchez-Galán<sup>1</sup>, and José Ulises Jiménez<sup>1</sup>

<sup>1</sup>Universidad Tecnológica de Panamá, Panamá, Panamá, Panamá

<sup>2</sup>Instituto de Investigación Agropecuaria de Panamá, Penonomé, Coclé, Panamá



**Figura 1:** Firmas espectrales promedio de la variedad de arroz FCA 616FL: (a) en estado vegetativo, parcela 1 en rojo y parcela 2 en verde, (b) en estado reproductivo, parcela 1 en rojo y parcela 2 en verde y (c) en estado de maduración, parcela 1 en verde y rojo, y parcela 2 en negro y azul



**Figura 7:** Biplot. Variedades de arroz FCA 616FL e IDIAP 54-05



# Plant Factories



DIVISIÓN POLÍTICA DE LA REPÚBLICA DE PANAMÁ,  
POR PROVINCIAS Y COMARCAS, AÑO 2010



LEYENDA

- Provincias
- Países Limítrofes
- Nombres de Provincias
- Hidrografía



Escala Gráfica 1: 2,500,000  
0 25 50 75 100 125  
Kilómetros



**INEC**  
Contraloría General de la República  
Instituto Nacional de Estadística y Censo

ELABORADO POR LA SECCIÓN DE CARTOGRAFÍA,  
INSTITUTO NACIONAL DE ESTADÍSTICA Y CENSO,  
CONTRALORÍA GENERAL DE LA REPÚBLICA

## + Project: “*Effects of LED lights on nutritional quality, growth and development of lettuce in controlled environments*”



2 shelves with 3 levels will be used to make the 5 treatments (5 replications), simultaneously



The experimental unit will consist of a plastic tray (55cm x 55cm x 10cm), with 16 seedlings  
An air pump will be used for each tray to keep the oxygen in the hydroponic solution



Substrate for root support will use sponge buckets



# Plant Factories



CHIBA  
UNIVERSITY



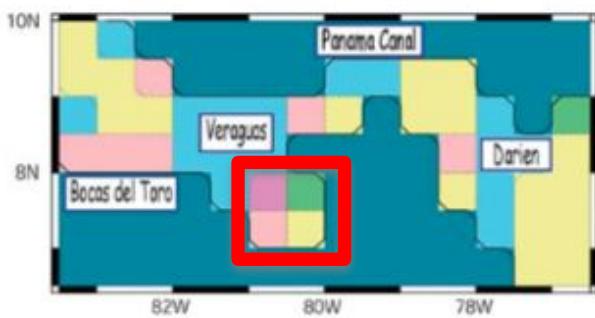
# + Future Climates & Maize Production



Meteorological Research Institute  
Japan Meteorological Agency



**Project:** Assessing future climates scenarios using a super-high resolution atmospheric-oceanic general circulation model (GCM) model adjusted for Panama: Implications in the Maize crop yield in the Azuero Peninsula



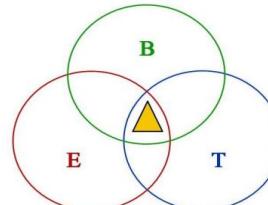
**Objective:** to provide an estimation of Maize crop yield in the near features and end-of-century future climates. Firstly, there will be an assessment of the impact of humidity and precipitation, however other variables reducing yield, such as: UV Radiation, Solar Energy, will be explored.

# + Future Climates & Maize Production



Meteorological Research Institute  
Japan Meteorological Agency





"VITA SICUT SCIENTIAM ET PROPOSITUM"

# Grupo de Investigación en Biotecnología, Bioinformática y Biología de Sistemas – GIBBS



**INDICASAT AIP**  
INSTITUTO DE INVESTIGACIONES CIENTÍFICAS  
Y SERVICIOS DE ALTA TECNOLOGÍA

Javier Sánchez Galán, PhD  
[javier.sanchezgalan@utp.ac.pa](mailto:javier.sanchezgalan@utp.ac.pa)  
**@utppanama**