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14. ABSTRACT The funds from the ARO were used to partially support the participation of graduate students and postdoctoral scholars (20 in total) in the 2016 Telluride workshop on molecular rotors, motors and switches. The workshop entailed 25 talks by leaders in the field who discussed recent advances in the field, and identified the basic science questions that need to be addressed to push the field forward. The workshop brought together experts from different areas of the field, and encouraged interactions between the speakers and students through formal and informal activities. The graduate students and postdoctoral researchers also showcased their research during a well-received

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Report Title

Final Report: 2016 Telluride Conference on Molecular Rotors, Motors and Switches

ABSTRACT

The funds from the ARO were used to partially support the participation of graduate students and postdoctoral scholars (20 in total) in the 2016 Telluride workshop on molecular rotors, motors and switches. The workshop entailed 25 talks by leaders in the field who discussed recent advances in the field, and identified the basic science questions that need to be addressed to push the field forward. The workshop brought together experts from different areas of the field, and encouraged interactions between the speakers and students through formal and informal activities. The graduate students and postdoctoral researchers also showcased their research during a well-received poster session. Four of the poster presenters were chosen for lightning-talks at the end of the workshop.

Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

<u>Received</u>	<u>Paper</u>
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TOTAL:

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

<u>Received</u>	<u>Paper</u>
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TOTAL:

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received Paper

TOTAL:

Number of Manuscripts:

Books

Received Book

TOTAL:

Received

Book Chapter

TOTAL:

Patents Submitted

Patents Awarded

Awards

Graduate Students

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Names of Post Doctorates

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Names of Faculty Supported

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Names of Under Graduate students supported

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: 0.00

The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:..... 0.00

Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):..... 0.00

Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense 0.00

The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields:..... 0.00

Names of Personnel receiving masters degrees

NAME

Total Number:

Names of personnel receiving PHDs

NAME

Total Number:

Names of other research staff

NAME

PERCENT SUPPORTED

FTE Equivalent:

Total Number:

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

The 2016 Telluride workshop on molecular rotors, motors and switches was held in Telluride (CO) on July 18-22. Fifty scientists attended the workshop, which included 25 talks by leaders in the field, and 4 lightning talks given by students chosen from the poster session. It is noteworthy that two of the talks were given by Fraser Stoddart, and Ben Feringa who later on in the year received the Nobel Prize in chemistry for their contributions to the field of molecular machines!

The schedule of the workshop was planned such that there was ample time for discussions after each talk. This format fostered in-depth deliberations, helped in fleshing out the challenges facing the field and means of addressing them, and contributed to the success of the workshop. Various topics were covered in the talks, such as developing new families of “smart” polymers, liquid crystals, and gels, designing new mechanically interlocked systems, and incorporating trigger elements into known drugs for targeted delivery. Applying molecular rotors in sensing applications, in addition to modulating ferroelectric properties of compounds and void sizes in metal organic frameworks, and engineering biological and synthetic systems that work out of equilibrium were also discussed. There was ample discussion on the latter concept, and how to design chemically activated systems that function out of equilibrium, and hence produce work. There was also a consensus that in addition to applications in solution such as drug delivery, there has to be a push for integrating molecular switches, motors and rotors in bulk materials (e. g., polymers and liquid crystals).

Because of its format and limited amount of participants, junior scientists seldom attend Telluride workshops. The community sees this as a shortcoming, and so actively encourages their presence in the molecular rotors, motors and switches workshop. The graduate students and postdoctoral scholars who attended the meeting (20 in total and supported by the grant) were active participants in the discussions in particular, and workshop in general. They had ample opportunities to learn from, and interact and network with leaders in field through formal (e.g, poster session) and informal activities (e.g., hikes during the breaks). These interactions fostered a feeling of community and inclusiveness that benefited all participants and contributed to the success of the workshop. Last but not least, an effort was made to increase the participation of female scientists in the workshop. We had 5 female invited speakers (out of 25) and the attendance of female scientists at the workshop was at 20%.

Technology Transfer

Molecular Rotors, Motors, and Switches

David Amabilino
Ivan Aprahamian
Edith Sevick

TSRC hosts: Mark Kozak (970) 708-4426 and Kristen Redd (970) 729-8375

Meeting Location:
[Telluride Elementary School](#)
447 W. Columbia Ave

MEETING AGENDA

Sunday, July 17

6:00-8:00 pm

Informal “Meet and Greet” at Arroyo Gallery and Wine Bar at 220 East Colorado Avenue. Cash Bar. Wine Specials. TSRC staff person will be there to answer any questions.

Monday, July 18

8:00 am	Breakfast at TSRC
8:30 am	Intro by Committee
8:40 am	Josef Michl
9:20 am	Piero Sozzani
10:00 am	DISCUSSION TIME
10:30 am	BREAK
10:50 am	David Williams
11:30 am	Anne-Sophie Duwez
12:10 pm	DISCUSSION TIME
12:40 pm	BREAK FOR LUNCH
2:00 pm	Akira Harada
2:40 pm	Rafal Klejn
3:20 pm	Stephen Goldup
4:00 pm	DISCUSSION
4:30 pm	BREAK
4:50 pm	FIRESIDE CHAT
5:30 pm	BREAK FOR DINNER
8:00-11:00 pm	POSTER SESSION

Tuesday, July 19

8:00 am	Breakfast at TSRC
8:30 am	Stefan Hecht
9:10 am	Hermann Wegner
9:50 am	DISCUSSION TIME

10:20 am	BREAK
10:40 am	Pance Naumov
11:20 am	Dean Astumian
12:00 pm	DISCUSSION TIME
12:30 pm	BREAK FOR LUNCH
2:00 pm	Chris Schalley
2:40 pm	Paula Mendes
3:20 pm	Raval Rasmita
4:00 pm	DISCUSSION
4:30 pm	BREAK FOR DINNER
6:00-7:15 pm	TSRC Town Talk, Conference Center in Mountain Village

Wednesday, July 20

Free morning for hiking

1:00 pm	Henry Hess
1:40 pm	Rein Ulijn
2:20 pm	DISCUSSION
2:50 pm	BREAK
3:10 pm	Amar Flood
3:50 pm	Javier Read de Alaniz
4:30 pm	Ben Feringa
5:10 pm	DISCUSSION
6:00 pm	Picnic at Ah Haa School for the Arts 300 S. Townsend

Thursday, July 21

8:00 am	Breakfast at TSRC
8:30 am	Tim Swager
9:10 am	Quan Li
9:50 am	DISCUSSION TIME
10:20 am	BREAK
10:40 am	Nathalie Katsonis
11:20 am	Michinori Suginome
12:00 pm	DISCUSSION TIME
12:30 pm	BREAK FOR LUNCH
2:00 pm	Rainer Herges
2:40 pm	POSTER TALKS
3:20 pm	DISCUSSION
3:50 pm	BREAK
4:10 pm	Fraser Stoddart
4:50 pm	DISCUSSION
5:20 pm	BREAK FOR DINNER

Friday, July 22

8:00 am

Breakfast at TSRC

INVITED SPEAKERS (in no particular order):

David Leigh (The University of Manchester)

Tim Swager (MIT)

Fraser Stoddart (Northwestern)

Ben Feringa (University of Groningen)

Josef Michl (University of Boulder Colorado)

Akira Harada (University of Osaka)

Anne-Sophie Duwez (University of Liège)

David Williams (Australian National University)

Paula Mendes (Birmingham University)

Chris Schalley (Free University of Berlin)

Pance Naumov (NYU Abu Dhabi)

Michinori Suginome (Kyoto University)

Amar Flood (Indiana University)

Stephen Goldup (University of Southampton)

Rafal Klejn (Weizmann Institute)

Nathalie Katsonis (University of Twente)

Natia Frank (University of Victoria)

Rainer Herges (Otto-Diels Institute)

David Williams (Australian National University)

Hermann Wegner (University of Giessen)

Stefan Hecht (Humboldt-Universität zu Berlin)

Quan Li (Kent State University)

Raval Rasmita (University of Liverpool)

Rein Ulijn (CUNY)

Dean Astumian (University of Maine)

Piero Sozzani (University of Milano-Bicocca)

Henry Hess (Columbia University)

Javier Read de Alaniz (UCSB)

