Transform Data with

 Adapted for Cressman and Dunnigan 2020

Joining Datasets

Motivating Example: Guana Fish data

```
names(fish)
```

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Motivating Example: Guana Fish data

```
names(fish)
```

1	anchoa_hepsetus
2	anchoa_mitchilli
3	brevoortia_tyrannus
4	brevoortia_sp
5	chaetodipterus_faber
6	ctenogobius_boleosoma
7	ctenogobius_pseudofasciatus

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Motivating Example: Guana Fish data

```
names(fish)
```

1	anchoa_hepsetus
2	anchoa_mitchilli
3	brevoortia_tyrannus
4	brevoortia_sp
5	chaetodipterus_faber
6	ctenogobius_boleosoma
7	ctenogobius_pseudofasciatus

13	callinectes_sapidus
14	callinectes_similus
15	callinectes_sp
16	farfantepenaeus_aztecus
17	litopenaeus_setiferus
18	palaemonetes_sp
19	lolliguncula_brevis

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Motivating Example: C data

Wait a second…. aren't these invertebrates??

```
names(fish)
```

1	anchoa_hepsetus
2	anchoa_mitchilli
3	brevoortia_tyrannus
4	brevoortia_sp
5	chaetodipterus_faber
6	ctenogobius_boleosoma
7	ctenogobius_pseudofasciatus
13	callinectes_sapidus
14	callinectes_similus
15	callinectes_sp
16	farfantepenaeus_aztecus
17	litopenaeus_setiferus
18	palaemonetes_sp
19	lolliguncula_brevis

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Motivating Example: Guana Fish data

Maybe we want to make a data frame that looks like this.
And we need to **bring additional information** into our data frame, as **additional columns**, based on matching.

UNID	species	type	n
1	anchoa_mitchilli	fish	1000
1	brevoortia_patronus	fish	50
1	callinectes_sapidus	invert	8
2	anchoa_mitchilli	fish	200
2	brevoortia_patronus	fish	600
2	callinectes_sapidus	invert	4

Motivating Example: Guana Fish data

```
View(critters)
```

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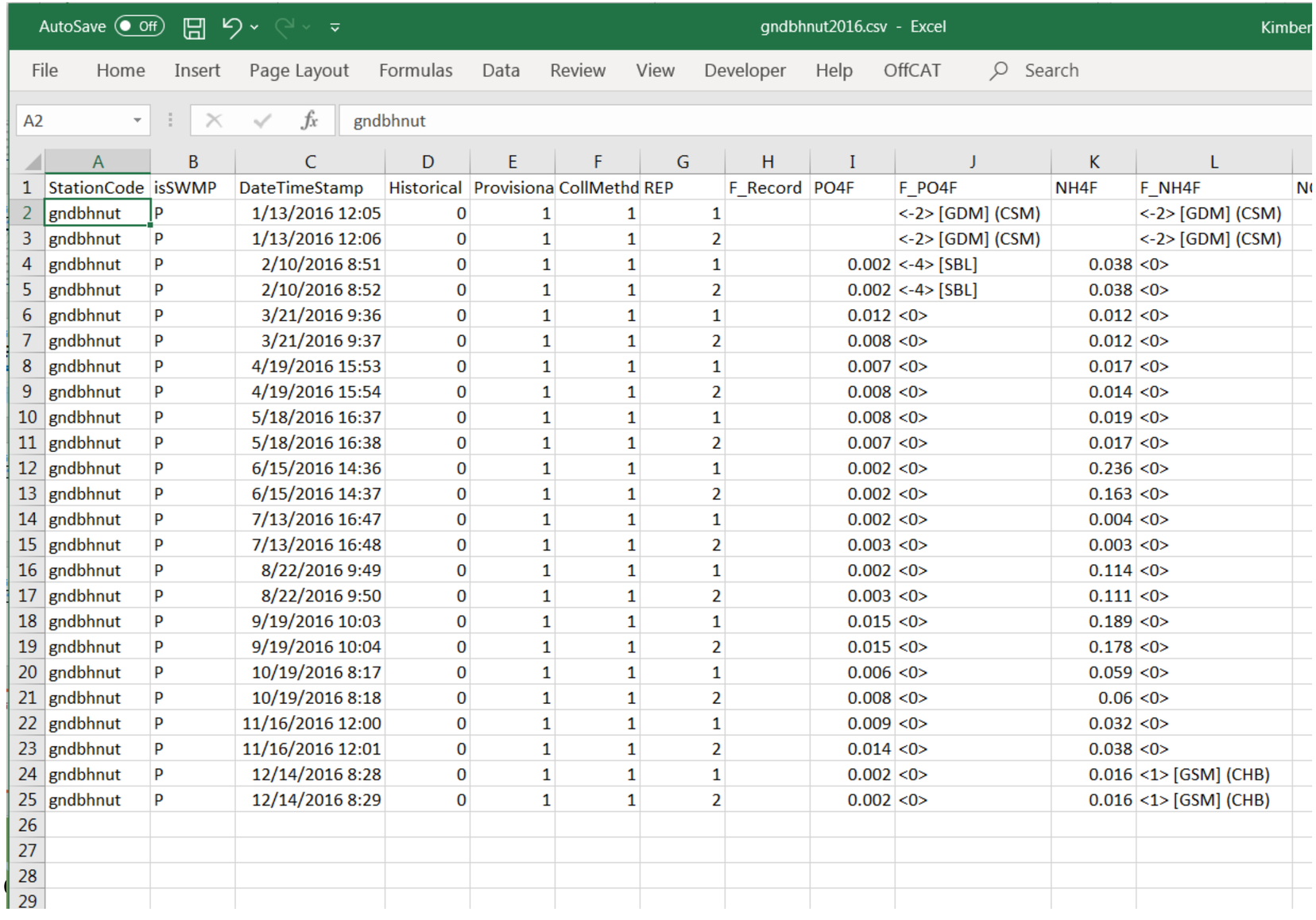
Motivating Exa na Fish data

```
View(critters)
```

	species	type
1	anchoa_hepsetus	fish
2	anchoa_mitchilli	fish
3	brevoortia_tyrannus	fish
4	brevoortia_sp	fish
5	chaetodipterus_faber	fish
6	ctenogobius_boleosoma	fish
7	ctenogobius_pseudofasciatus	fish
8	ctenogobius_sp	fish
9	cynoscion_nebulosus	fish
10	cynoscion_sp	fish
11	cynoscion_sp_2	fish
12	cyprinodon_variegatus	fish
13	callinectes_sapidus	invert
14	callinectes_similus	invert
15	callinectes_sp	invert
16	farfantepenaeus_aztecus	invert
17	litopenaeus_setiferus	invert
18	palaemonetes_sp	invert
19	lolliguncula_brevis	invert

Motivating Example 2: yearly data files



	A	B	C	D	E	F	G	H	I	J	K	L
1	StationCode	isSWMP	DateTimeStamp	Historical	Provisiona	CollMethd	REP	F_Record	PO4F	F_PO4F	NH4F	F_NH4F
2	gndbhnut	P	1/13/2016 12:05	0	1	1	1			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
3	gndbhnut	P	1/13/2016 12:06	0	1	1	2			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
4	gndbhnut	P	2/10/2016 8:51	0	1	1	1		0.002	<-4> [SBL]	0.038	<0>
5	gndbhnut	P	2/10/2016 8:52	0	1	1	2		0.002	<-4> [SBL]	0.038	<0>
6	gndbhnut	P	3/21/2016 9:36	0	1	1	1		0.012	<0>	0.012	<0>
7	gndbhnut	P	3/21/2016 9:37	0	1	1	2		0.008	<0>	0.012	<0>
8	gndbhnut	P	4/19/2016 15:53	0	1	1	1		0.007	<0>	0.017	<0>
9	gndbhnut	P	4/19/2016 15:54	0	1	1	2		0.008	<0>	0.014	<0>
10	gndbhnut	P	5/18/2016 16:37	0	1	1	1		0.008	<0>	0.019	<0>
11	gndbhnut	P	5/18/2016 16:38	0	1	1	2		0.007	<0>	0.017	<0>
12	gndbhnut	P	6/15/2016 14:36	0	1	1	1		0.002	<0>	0.236	<0>
13	gndbhnut	P	6/15/2016 14:37	0	1	1	2		0.002	<0>	0.163	<0>
14	gndbhnut	P	7/13/2016 16:47	0	1	1	1		0.002	<0>	0.004	<0>
15	gndbhnut	P	7/13/2016 16:48	0	1	1	2		0.003	<0>	0.003	<0>
16	gndbhnut	P	8/22/2016 9:49	0	1	1	1		0.002	<0>	0.114	<0>
17	gndbhnut	P	8/22/2016 9:50	0	1	1	2		0.003	<0>	0.111	<0>
18	gndbhnut	P	9/19/2016 10:03	0	1	1	1		0.015	<0>	0.189	<0>
19	gndbhnut	P	9/19/2016 10:04	0	1	1	2		0.015	<0>	0.178	<0>
20	gndbhnut	P	10/19/2016 8:17	0	1	1	1		0.006	<0>	0.059	<0>
21	gndbhnut	P	10/19/2016 8:18	0	1	1	2		0.008	<0>	0.06	<0>
22	gndbhnut	P	11/16/2016 12:00	0	1	1	1		0.009	<0>	0.032	<0>
23	gndbhnut	P	11/16/2016 12:01	0	1	1	2		0.014	<0>	0.038	<0>
24	gndbhnut	P	12/14/2016 8:28	0	1	1	1		0.002	<0>	0.016	<1> [GSM] (CHB)
25	gndbhnut	P	12/14/2016 8:29	0	1	1	2		0.002	<0>	0.016	<1> [GSM] (CHB)
26												
27												
28												
29												

 Adapted for (

Motivating Example 2: yearly data files

StationCode	isSWMP	DateTimeStamp	Historical	Provisiona	CollMethd	REP	F_Record	PO4F	F_PO4F	NH4F	F_NH4F	N
gndbhnut	P	1/13/2016 12:05	0	1	1	1			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)	
gndbhnut	P	1/13/2016 12:06	0	1	1	2			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)	
gndbhnut	P	2/10/2016 8:51	0	1	1	1		0.002	<-4> [SBL]	0.038	<0>	
gndbhnut	P	11/16/2016 12:00	0	1	1	1		0.009	<0>	0.032	<0>	
gndbhnut	P	11/16/2016 12:01	0	1	1	2		0.014	<0>	0.038	<0>	
gndbhnut	P	12/14/2016 8:28	0	1	1	1		0.002	<0>	0.016	<1> [GSM] (CHB)	
gndbhnut	P	12/14/2016 8:29	0	1	1	2		0.002	<0>	0.016	<1> [GSM] (CHB)	
gndbhnut	P	1/17/2017 11:18	0	1	1	1		0.004	<0>	0.153	<0>	
gndbhnut	P	1/17/2017 11:19	0	1	1	2		0.005	<0>	0.153	<0>	
gndbhnut	P	2/13/2017 10:43	0	1	1	1		0.002	<-4> [SBL]	0.158	<0>	
gndbhnut	P	2/13/2017 10:44	0	1	1	2		0.002	<-4> [SBL]	0.173	<0>	
gndbhnut	P	3/13/2017 10:56	0	1	1	1		0.003	<0>	0.157	<0>	
gndbhnut	P	3/13/2017 10:57	0	1	1	2		0.002	<0>	0.148	<0>	
gndbhnut	P	4/10/2017 16:35	0	1	1	1		0.002	<0>	0.01	<0>	
gndbhnut	P	4/10/2017 16:36	0	1	1	2		0.004	<0>	0.01	<0>	
gndbhnut	P	5/8/2017 17:19	0	1	1	1		0.002	<-4> [SBL]	0.09	<0>	
gndbhnut	P	5/8/2017 17:20	0	1	1	2		0.002	<0>	0.081	<0>	
gndbhnut	P	6/19/2017 16:09	0	1	1	1		0.016	<0>	0.064	<0>	
gndbhnut	P	6/19/2017 16:10	0	1	1	2		0.018	<0>	0.128	<0>	
gndbhnut	P	7/19/2017 16:32	0	1	1	1		0.006	<0>	0.012	<0>	

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Motivating Example 2: yearly data files

StationCode	isSWMP	DateTimeStamp	Historical	Provisiona	CollMethd	REP	F_Record	PO4F	F_PO4F	NH4F	F_NH4F	N
gndbhnut	P	1/13/2016 12:05	0	1	1	1			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)	
gndbhnut	P	1/13/2016 12:06	0	1	1	2			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)	
gndbhnut	P	2/10/2016 8:51	0	1	1	1		0.002	<-4> [SBL]	0.038	<0>	
gndbhnut	P	11/16/2016 12:00	0	1	1	1		0.009	<0>	0.032	<0>	
gndbhnut	P	11/16/2016 12:01	0	1	1	2		0.014	<0>	0.038	<0>	
gndbhnut	P	12/14/2016 8:28	0	1	1	1		0.002	<0>	0.016	<1> [GSM] (CHB)	
gndbhnut	P	12/14/2016 8:29	0	1	1	2		0.002	<0>	0.016	<1> [GSM] (CHB)	

Again, we need to **bring additional information** into our data frame. This time as **additional rows**.

gndbhnut	P	1/17/2017 11:18	0	1	1	1		0.004	<0>	0.153	<0>	
gndbhnut	P	1/17/2017 11:19	0	1	1	2		0.005	<0>	0.153	<0>	
gndbhnut	P	2/13/2017 10:43	0	1	1	1		0.002	<-4> [SBL]	0.158	<0>	
gndbhnut	P	2/13/2017 10:44	0	1	1	2		0.002	<-4> [SBL]	0.173	<0>	
gndbhnut	P	3/13/2017 10:56	0	1	1	1		0.003	<0>	0.157	<0>	
gndbhnut	P	3/13/2017 10:57	0	1	1	2		0.002	<0>	0.148	<0>	
gndbhnut	P	4/10/2017 16:35	0	1	1	1		0.002	<0>	0.01	<0>	
gndbhnut	P	4/10/2017 16:36	0	1	1	2		0.004	<0>	0.01	<0>	
gndbhnut	P	5/8/2017 17:19	0	1	1	1		0.002	<-4> [SBL]	0.09	<0>	
gndbhnut	P	5/8/2017 17:20	0	1	1	2		0.002	<0>	0.081	<0>	
gndbhnut	P	6/19/2017 16:09	0	1	1	1		0.016	<0>	0.064	<0>	
gndbhnut	P	6/19/2017 16:10	0	1	1	2		0.018	<0>	0.128	<0>	
gndbhnut	P	7/19/2017 16:32	0	1	1	1		0.006	<0>	0.012	<0>	

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Motivating Example 2: yearly data files

StationCode	isSWMP	DateTimeStamp	Historical	Provisiona	CollMethd	REP	F_Record	PO4F	F_PO4F	NH4F	F_NH4F	N
gndbhnut	P	1/13/2016 12:05	0	1	1	1			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)	
gndbhnut	P	1/13/2016 12:06	0	1	1	2			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)	
gndbhnut	P	2/10/2016 8:51	0	1	1	1		0.002	<-4> [SBL]	0.038	<0>	
gndbhnut	P	11/16/2016 12:00	0	1	1	1		0.009	<0>	0.032	<0>	
gndbhnut	P	11/16/2016 12:01	0	1	1	2		0.014	<0>	0.038	<0>	
gndbhnut	P	12/14/2016 8:28	0	1	1	1		0.002	<0>	0.016	<1> [GSM] (CHB)	
gndbhnut	P	12/14/2016 8:29	0	1	1	2		0.002	<0>	0.016	<1> [GSM] (CHB)	
gndbhnut	P	1/17/2017 11:18	0	1	1	1		0.004	<0>	0.153	<0>	
gndbhnut	P	1/17/2017 11:19	0	1	1	2		0.005	<0>	0.153	<0>	
gndbhnut	P	2/13/2017 10:43	0	1	1	1		0.002	<-4> [SBL]	0.158	<0>	
gndbhnut	P	2/13/2017 10:44	0	1	1	2		0.002	<-4> [SBL]	0.173	<0>	
gndbhnut	P	3/13/2017 10:56	0	1	1	1		0.003	<0>	0.157	<0>	
gndbhnut	P	3/13/2017 10:57	0	1	1	2		0.002	<0>	0.148	<0>	
gndbhnut	P	4/10/2017 16:35	0	1	1	1		0.002	<0>	0.01	<0>	
gndbhnut	P	4/10/2017 16:36	0	1	1	2		0.004	<0>	0.01	<0>	
gndbhnut	P	5/8/2017 17:19	0	1	1	1		0.002	<-4> [SBL]	0.09	<0>	
gndbhnut	P	5/8/2017 17:20	0	1	1	2		0.002	<0>	0.081	<0>	
gndbhnut	P	6/19/2017 16:09	0	1	1	1		0.016	<0>	0.064	<0>	
gndbhnut	P	6/19/2017 16:10	0	1	1	2		0.018	<0>	0.128	<0>	
gndbhnut	P	7/19/2017 16:32	0	1	1	1		0.006	<0>	0.012	<0>	

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Your Turn 1
5 minutes

1. Run the code chunk starting on line 18 to generate toy data.
2. Import the following data frames, and make sure the column names are all lower-case and connected by underscores (_); no spaces or periods.
   a. guana_fish_subset.csv, as a data frame called "fish"
   b. critter_types.csv, as a data frame called "critters"
3. Examine all the data frames you now have.

Your Turn 1
Answer

```
fish <- read.csv(here::here("data", "guana_fish_subset.csv"),
                 stringsAsFactors = FALSE) %>%
        janitor::clean_names()
critters <- read.csv(here::here("data", "critter_types.csv"),
                     stringsAsFactors = FALSE)
```

mutating joins

Motivating Example: Guana Fish data

additional information
as **additional columns**

UNID	species	type	n
1	anchoa_mitchilli	fish	1000
1	brevoortia_patronus	fish	50
1	callinectes_sapidus	invert	8
2	anchoa_mitchilli	fish	200
2	brevoortia_patronus	fish	600
2	callinectes_sapidus	invert	4

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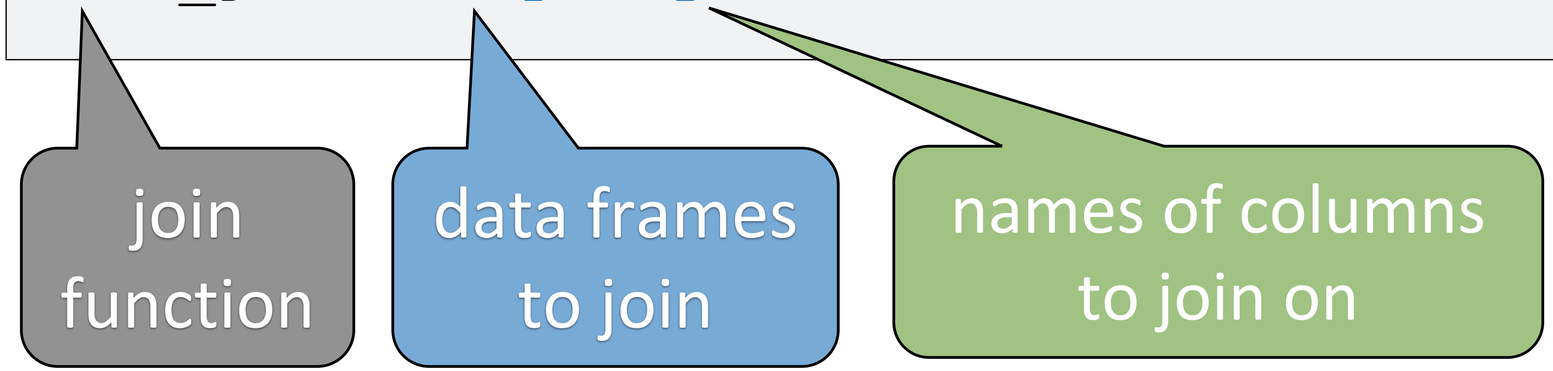
common syntax

Each join function returns a data frame / tibble.

```
left_join(x, y, by = NULL, … )
```



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Toy data

```
band <- tribble(
   ~name,     ~band,
  "Mick",  "Stones",
  "John", "Beatles",
  "Paul", "Beatles"
)
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

```
instrument <- tribble(
    ~name,   ~plays,
   "John", "guitar",
   "Paul",   "bass",
  "Keith", "guitar"
)
```

instrument

name	plays
John	guitar
Paul	bass
Keith	guitar

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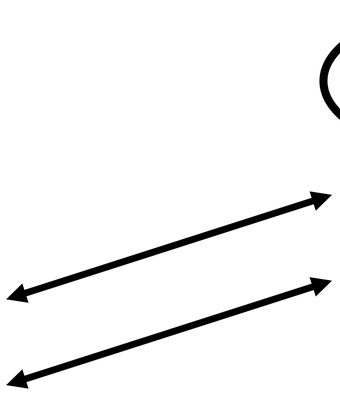
Toy data

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

instrument

name	plays
John	guitar
Paul	bass
Keith	guitar



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left

```
band %>% left_join(instrument, by = "name")
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

+

instrument

name	plays
John	guitar
Paul	bass
Keith	guitar

=

name	band	plays
Mick	Stones	<NA>
John	Beatles	guitar
Paul	Beatles	bass

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right

```
band %>% right_join(instrument, by = "name")
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

+

instrument

name	plays
John	guitar
Paul	bass
Keith	guitar

=

name	band	plays
John	Beatles	guitar
Paul	Beatles	bass
Keith	<NA>	guitar

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full

```
band %>% full_join(instrument, by = "name")
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

+

instrument

name	plays
John	guitar
Paul	bass
Keith	guitar

=

name	band	plays
Mick	Stones	<NA>
John	Beatles	guitar
Paul	Beatles	bass
Keith	<NA>	guitar

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inner

```
band %>% inner_join(instrument, by = "name")
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

+

instrument

name	plays
John	guitar
Paul	bass
Keith	guitar

=

name	band	plays
John	Beatles	guitar
Paul	Beatles	bass

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What if the names do not match?

Use a named vector to match on variables with different names.

```
df1 %>% left_join(df2, by = c("df1_col" = "df2_col"))
```

A named vector

The name of the element = the column name in the first data set

The value of the element = the column name in the second data set

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Toy data

```
band <- tribble(
   ~name,     ~band,
  "Mick",  "Stones",
  "John", "Beatles",
  "Paul", "Beatles"
)
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

```
instrument2 <- tribble(
    ~artist,   ~plays,
   "John", "guitar",
   "Paul",   "bass",
  "Keith", "guitar"
)
```

instrument2

artist	plays
John	guitar
Paul	bass
Keith	guitar

nonmatching names

```
band %>% left_join(instrument2, by = c("name" = "artist"))
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

+

instrument2

artist	plays
John	guitar
Paul	bass
Keith	guitar

=

name	band	plays
Mick	Stones	<NA>
John	Beatles	guitar
Paul	Beatles	bass

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Your Turn 2
10 minutes

```
fish %>%
  pivot_____(________)%>%
  _____join(_________) %>%
  group_by(_________) %>%
  _________(_________)
```

1. **Pivot fish to a long format, with one row per species per sample**
2. **Join critters to fish**
3. **Compute the total number caught by type (fish/invertebrate), by time of day (day/night)**

Your Turn 2
Answer

```
fish %>%
  pivot_longer(cols = 2:20,
               names_to = "species",
               values_to = "count") %>%
  left_join(critters, by = "species") %>%
  group_by(type, diel) %>%
  summarize(total = sum(count))
```

Your Turn 2
Answer

```
fish %>%
  pivot_longer(cols = 2:20,
               names_to = "species",
               values_to = "count") %>%
  left_join(critters, by = "species") %>%
  group_by(type, diel) %>%
  summarize(total = sum(count)) %>%
  pivot_wider(names_from = type,
              values_from = total)
```

filtering joins

filtering joins

Mutating joins use information from one data set **to add variables** to another data set (like **mutate()**)

Filtering joins use information from one data set **to extract cases** from another data set (like **filter()**)

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semi

```
band %>% semi_join(instrument, by = "name")
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

+

instrument

name	plays
John	guitar
Paul	bass
Keith	guitar

=

name	band
John	Beatles
Paul	Beatles

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anti

```
band %>% anti_join(instrument, by = "name")
```

band

name	band
Mick	Stones
John	Beatles
Paul	Beatles

+

instrument

name	plays
John	guitar
Paul	bass
Keith	guitar

=

name	band
Mick	Stones

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Recap: Two table verbs

left_join() retains all cases in **left** data set

right_join() retains all cases in **right** data set

full_join() retains all cases in **either** data set

inner_join() retains only cases in **both** data sets

semi_join() extracts cases that **have a match**

anti_join() extracts cases that **do not have a match**

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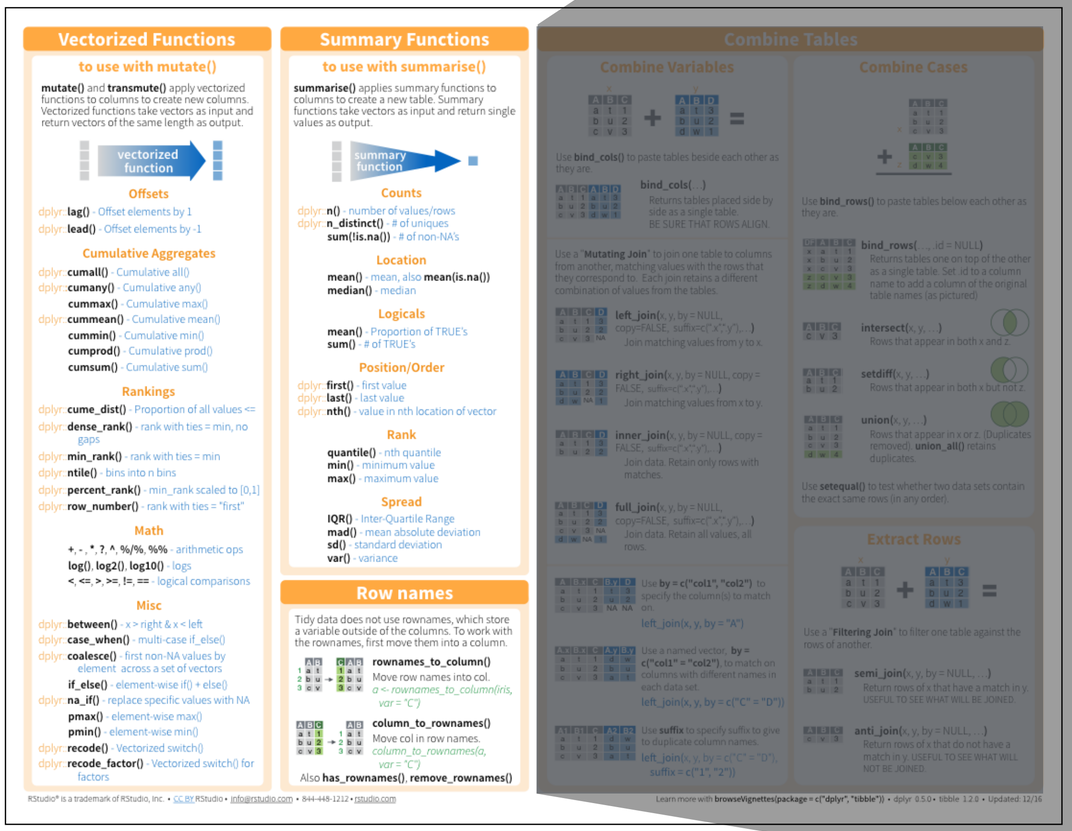
Two table verbs

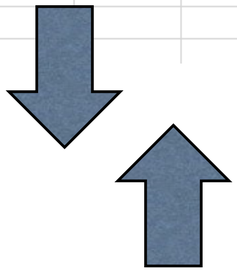


 Adapted for Cressman and Dunnigan 2020

row/column binding

rows: rbind() or dplyr::bind_rows()

StationCode	isSWMP	DateTimeStamp	Historical	Provisiona	CollMethd	REP	F_Record	PO4F	F_PO4F	NH4F	F_NH4F	N
gndbhnut	P	1/13/2016 12:05	0	1	1	1			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)	
gndbhnut	P	1/13/2016 12:06	0	1	1	2			<-2> [GDM] (CSM)		<-2> [GDM] (CSM)	
gndbhnut	P	2/10/2016 8:51	0	1	1	1		0.002	<-4> [SBL]	0.038	<0>	
gndbhnut	P	11/16/2016 12:00	0	1	1	1		0.009	<0>	0.032	<0>	
gndbhnut	P	11/16/2016 12:01	0	1	1	2		0.014	<0>	0.038	<0>	
gndbhnut	P	12/14/2016 8:28	0	1	1	1		0.002	<0>	0.016	<1> [GSM] (CHB)	
gndbhnut	P	12/14/2016 8:29	0	1	1	2		0.002	<0>	0.016	<1> [GSM] (CHB)	



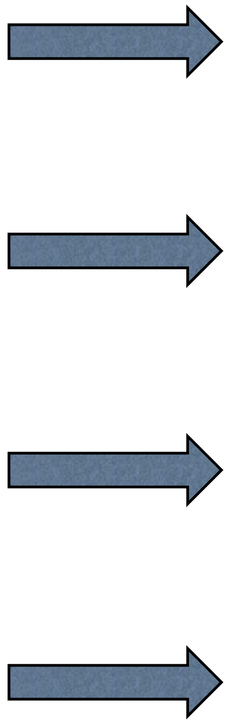
additional information as **additional rows**.

gndbhnut	P	1/17/2017 11:18	0	1	1	1		0.004	<0>	0.153	<0>	
gndbhnut	P	1/17/2017 11:19	0	1	1	2		0.005	<0>	0.153	<0>	
gndbhnut	P	2/13/2017 10:43	0	1	1	1		0.002	<-4> [SBL]	0.158	<0>	
gndbhnut	P	2/13/2017 10:44	0	1	1	2		0.002	<-4> [SBL]	0.173	<0>	
gndbhnut	P	3/13/2017 10:56	0	1	1	1		0.003	<0>	0.157	<0>	
gndbhnut	P	3/13/2017 10:57	0	1	1	2		0.002	<0>	0.148	<0>	
gndbhnut	P	4/10/2017 16:35	0	1	1	1		0.002	<0>	0.01	<0>	
gndbhnut	P	4/10/2017 16:36	0	1	1	2		0.004	<0>	0.01	<0>	
gndbhnut	P	5/8/2017 17:19	0	1	1	1		0.002	<-4> [SBL]	0.09	<0>	
gndbhnut	P	5/8/2017 17:20	0	1	1	2		0.002	<0>	0.081	<0>	
gndbhnut	P	6/19/2017 16:09	0	1	1	1		0.016	<0>	0.064	<0>	
gndbhnut	P	6/19/2017 16:10	0	1	1	2		0.018	<0>	0.128	<0>	
gndbhnut	P	7/19/2017 16:32	0	1	1	1		0.006	<0>	0.012	<0>	

 Adapted for Cressman and Dunnigan 2020

columns: cbind() or dplyr::bind_cols()

	year_sampled	salinity_ppt	water_temp_c
1	2005	8.1	23.3
2	2005	7.9	24.3
3	2005	8.2	24.8
4	2005	8.2	25.3
5	2005	9.0	24.8
6	2005	9.2	28.1
7	2005	8.4	26.2
8	2005	8.9	27.3
9	2005	11.5	27.6
10	2005	10.3	27.8
11	2005	10.4	26.5
12	2005	12.0	28.9
13	2005	10.2	27.6
14	2005	18.5	29.3



	Comp.1	Comp.2	Comp.3	Comp.4		
1	-1.469666048	0.50861098	-0.815343241	-1.46335107		
2	-1.755692184	0.24370146	-0.836290971	-2.18330031		
3	1.080570412	0.35374028	-2.236078623	-1.74776945		
4	-1.369822421	0.17215002	-1.135181748	-2.24956333		
5	-3.314759863	0.37444935	-0.137357002	-1.45224979		
6	-1.986256735	0.49716679	-1.157056717	-1.09732360		
7	-3.498663437	0.32469551	-0.265300898	-1.79427409		
8	-0.261967574	0.41546947	-1.878794797	-1.38602895		
9	-3.517448511	0.00847880	-0.318385366	-1.433961470	-0.480111879	0.517224945
10	-2.478236506	0.03892872	-0.867960703	-1.807396915	-0.268748165	0.130365940
11	1.766413104	0.23587234	-2.718299079	-1.189025121	-1.549863557	0.526441638
12	-1.401074695	0.04024652	-1.431812399	-1.186210314	-0.747486755	-0.207109698
13	-3.001089532	0.20084810	-0.598864512	-1.447290637	-0.701023350	0.275340991
14	-3.459846552	-0.54891989	-0.283326428	-0.239123537	-0.715070929	0.405253969

rows match
but
no identifying information for a join

- after PCA/nMDS
- after a ‘for’ loop

 Adapted for Cressman and Dunnigan 2020

Your Turn 3
3 minutes

Make sure to run the “Toy data for binding” code chunk, starting on line 163 of your .Rmd file.

Then navigate to line 219, “Your Turn 3”. Take a guess at what the next two code chunks will return.

Were you right? Were you surprised? Tell us in the chat box!

Your Turn 4
5 minutes

Run the code chunk starting on line 245.

In the following code chunk, use both rbind and bind_rows() to join bh2016 and bh2017 together. Examine them. Are they the same? Did you expect them to be?

One more code chunk: use both rbind and bind_rows() to bind all **three** bh data frames together. Examine them and answer the same questions.